Asiatic Echoes

The Identification of Ancient Chinese Pictograms in pre-Columbian North American Rock Writing

Third Edition

Including Supplemental Reports
and
54 New Pictogram-glyph
Comparison Charts

By John A. Ruskamp, Jr.
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To Linda

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"It would be a relatively simple matter if the Chinese Buddhists had been as thoughtful as 'Kilroy' and had taken time out to have carved their names in Chinese characters on solid rock…. If they did, perhaps we have not yet recognized it."

Henriette Mertz

Preface to the Third Edition

Initially, I did not intentionally set out to find the glyphs analyzed on the following pages; rather, over the years our paths crossed. It was while hiking with my family in Utah that I first became aware of a most remarkable petroglyph. As my eyes were transfixed upon one of the most spectacular examples of pre-Columbian writing in all of North America, the Nine Mile Canyon Zhōu pictogram, I exclaimed, "I know what that means. That is, I can read it!"

Likely, my prior exposure to Chinese writing assisted me in deciphering the message encoded by the line strokes of this character. Alternatively, it may have been serendipity, divine providence, the rocks, or the ancients themselves, that provided me with insight. Whatever it was, the personal challenge presented to me as I viewed this symbol was instantly accepted… could I find, read, and interpret other such imagery?

The petroglyphs and pictographs analyzed here were chosen without conjecture, for each appears based solely upon the visual appeal of its line strokes. As part of what has evolved into an ongoing study, as of this writing 107 diverse ancient Chinese pictograms have been identified in the North American rock writing record. Of this number, 53 representative pictogram-glyphs are discussed in detail in the first section of this report. Collectively, these 53 scripts are more than sufficient for proving that in pre-Columbian times Chinese pictograms were employed for writing, sometimes with identifiable Chinese syntax, in North America.

Many are desirous of investigating worldwide intercultural contacts, transmissions, and influences. On the pages that follow, for the first time, the reader is presented with demonstrable analytical proof that, in fact, multiple ancient Chinese script characters are located at scattered sites across North America. If a picture's meaning can express ten thousand words, then the echoes generated by the Chinese script characters presented on the following pages reverberate loudly as they inform us of their unique ancestry. I leave to others the task of demonstrating how such complex ancient scripts were recreated in North America, a feat without precedence for any formal writing system, apart from prior knowledge of the script styles and syntax of distinctive ancient Chinese writing. Moreover, in spite of institutional bias against the conclusions of this study, as of this printing no solidly scientific evidence refuting them has been set forth... anywhere.

In this report, I have not minced words. Nor is the reader led on a speculative and fanciful journey by the use of confusing and misleading phrases such as "could be," "looks like," "may have been," or "probably was." Rather, the statistically verifiable substantial similarity of each of this study's pictogram-glyph comparisons provides the reader with the salient message... these are identifiable and readable ancient pre-Columbian Chinese script characters that can only be credited to ancient Chinese authorship.

Introduction

The history of rock art is fascinating and mysterious. Many thousands of these ancient images have been observed and studied, yet the purpose and meaning for most of them remain an enigma. Typically, those who encounter ancient rock art, and writing, recognize the effort it took to create such impressive figures, some the size of modern billboards. The high level of artistic skill exhibited by the more elaborate illustrations, and their sometimes precarious placement, high on canyon walls or in other generally inaccessible areas, indicate that the authors of these symbols were very purposeful and in a sober state of mind. To date, only a limited number of generally speculative interpretations for a few of the most common petroglyph (carved) and pictograph (painted) depictions have been compiled (Cole 1990: 36).

Curiously, while pre-historic rock writings exist at numerous sites throughout the world, most modern scholars believe that systems of formal writing were independently invented at only five locations: in Mesopotamia, China, Mesoamerica, Egypt, and probably in the Indus Valley (Figure 1). In Mesopotamia, the Sumerians are known to have begun utilizing a standardized form of script around 3300 BC, and the Chinese invented an entirely different style of pictographic writing sometime before 1700 BC. After 300 BC, the Mayans, possibly building upon the seminal work of an earlier Olmec population, developed their own sophisticated system of writing. Additionally, about 3100 BC the Egyptians developed hieroglyphics; and shortly thereafter, around 2600 BC, the people of the Indus Valley likely created their own unique style of script.

Figure 1
Locations where writing originated

For ancient societies, writing was an important activity; and the role of the scribe was an honored position with considerable responsibility. Many cultures attributed the origin of writing to deities, who ultimately shared their special knowledge with humanity. Today, some indigenous populations still attribute humanity's ability to write to the intervention of gods or "ancient ones," for which they have only a vague remembrance.

Fortunately, in some instances, native populations have been able to provide historically based insights and frames of reference for the interpretation of some rock imagery. In such cases, both the folklore and religious traditions of these people provide a valid means for understanding a few of the more representational and symbolic depictions. However, when there is no specific remembrance of what the intention or motivation for making these characters might have been, there is an obvious interpretive void. With few exceptions, the information preserved by most rock art and writing remains unknown.

In academia, speculation on the meaning of petroglyphs and pictographs, created by less than perfectly understood ancient populations, invokes lively discourse. Some images appear as true artwork, created solely for artistic and decorative purposes. Other designs clearly record historical events such as hunting scenes, harvests, initiations, and clan migrations. Additional images appear as if they were the random doodling of ancient graffiti artists whiling away the hours, each employing a unique artistic style. Nevertheless, in some instances rock characters express representational forms, patterns, and alignments, suggestive of script.

For over a century, knowledgeable researchers have suggested that a few North American glyphs share characteristics with Chinese script. However, constrained by prior beliefs and peer pressure, most serious rock art investigators have summarily dismissed this information without any further investigation.

As a result, most professional archaeologists and anthropologists avoid commenting on the topic of interpretive rock art research. Without an established methodology to guide their research, along with any subsequent translation of native picture writing, and with little financial support available for such endeavors, scientists have been unwilling to wager their professional reputations on such a risky undertaking.

To date, there is no record for the use of formal writing by any of the native people of North America, other than what might have been some simple temporary notations used by the Micmac people of the Northeast. Nevertheless, in spite of growing evidence that Native Americans utilized detailed and exacting astronomical and engineering data, at locations such as the Newark Mounds, Cahokia, and Chaco Canyon, experts still contend that ancient Native Americans did not write or use script... however, did they?

Millions of glyphs are carved, pecked, and painted upon the rocks of North America, and almost all of these images preserve meaningful information encoded by their mostly Native authors. Yet, lacking an agreed upon comprehensive construct for deciphering North American picture writing, to date little proof exists for the proper interpretation of these ancient messages.

Providentially, proven methodologies already exist in other disciplines that can advance our understanding of some ancient rock writing. Both the established legal construct of artistic "substantial similarity," and the comparative statistical instrument, Jaccard's Index of Similarity, are powerful interpretive tools. When combined for analysis, they generate robust, demonstrable, and impartial data that can reveal not only the relationship of images, but also, for unknown script symbolism, its meaning.

In this study, these two evaluative tools are employed together to assess the level of line stroke similarity shared by artistically complex North American rock images and conforming ancient Chinese pictograms. As of this printing a total of 107 ancient Chinese script pictogram-glyphs have been identified, 105 of which are located in the Southwestern United States (Figure 2). *The fact that multiple world-renown Chinese epigraphers have confirmed the readability of all of these scripts proves what to some has always been apparent, and what to others cannot be: that ancient Chinese writings are embedded alongside of some North American rock art.*

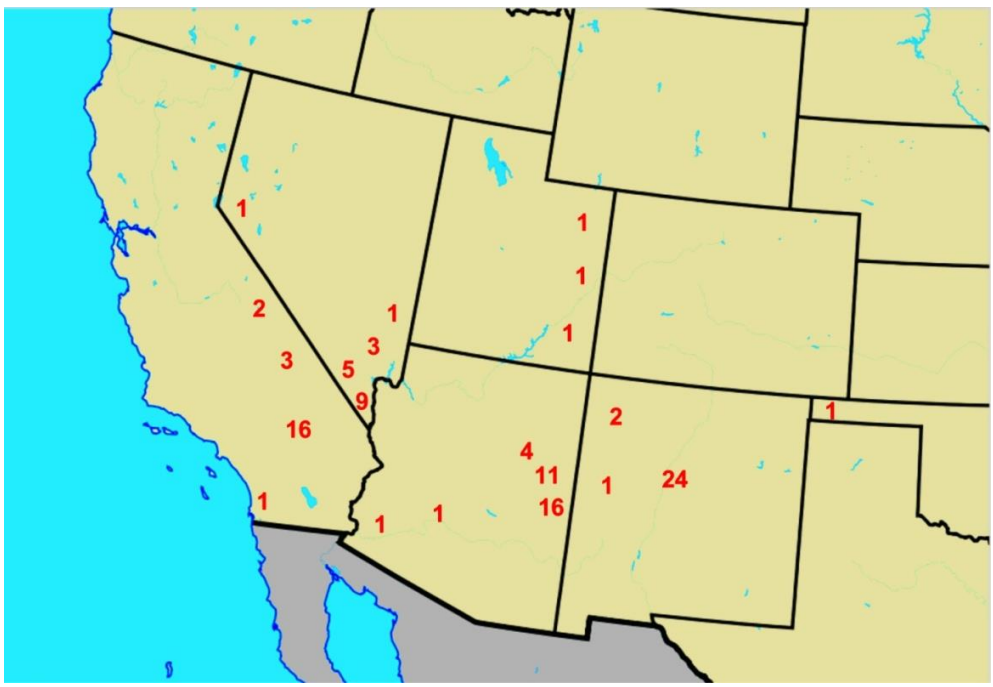


Figure 2
The number and location of ancient Chinese pictogram-glyphs identified
in the Southwestern United States as of December 2015

Early Attempts to Interpret North American Rock Writing

In 1675, Fr. Pere Jacques Marquette penned one of the earliest surviving descriptions of a North American pictograph. As he and his partner, Louis Joliet, paddled down the Mississippi River north of St. Louis, Missouri, Marquette entered in his journal the following description of the image he saw on a bluff near what is today Alton, Illinois (Figure 3):

> "On the flat face of a high rock were painted, in red, black, and green, a pair of monsters, each as large as a calf, with horns like a deer, red eyes, a beard like a tiger, and a frightful expression of countenance. The face is something like that of a man, the body covered with scales; and the tail so long that it passes entirely round the body, over the head, and between the legs, ending like that of a fish." (Translation by Dr. Francis Parkman)

Figure 3
Henry Lewis - 1847 Piasa Bird lithograph
Image: St. Louis Mercantile Library at the University of Missouri St. Louis

Two hundred years after Marquette and Joliet made their historic voyage into the heart of the continent, research focused on documenting and investigating the remaining vestiges of Native American culture began in earnest, as the dynamic era of the late 1800's witnessed an explosion of scientific knowledge in many fields. However, this was a period of both intellectual and social flux; consequently, in some academic disciplines, new ideas took hold more expeditiously than they did in others.

During this period, with increasing rapidity scientific discoveries revised mankind's understanding of the natural world. The core sciences of chemistry, physics, and biology advanced quickly, as they were well suited to benefit from the investigative paradigm of statistically based research methodologies. However, in the social sciences, where true experimentation is much more difficult to carry out, antiquated dogmas remained entrenched for many more years. Changes in these subjects developed slowly, as it took longer for scientific discoveries to become incorporated in such academic disciplines as anthropology, linguistics, and sociology.

Lingering Damage from Early Investigations

In the late 19th century, archaeological research gained momentum, as it increasingly embraced many of the significant discoveries made in the allied fields of analytical chemistry, atomic physics, and research methodology. Nevertheless, while scientifically based facts were gradually integrated into humanity's worldview during this time, overly simplistic and highly speculative theories persisted in many academic specialties. On both natural and anthropic topics, a plethora of unsubstantiated findings continued to be published, based on little more than the partial knowledge of overly exuberant investigators. Today, many of the interpretations published by these scholars are deemed erroneous and spurious, lacking both the validity and reliability required for modern research endeavors.

Recognizing the public's fascination with novelties, in the progressive era of the early 20th century, the media eagerly reported anything claiming to be "scientific" as a way to increase sales. Unfortunately, sometimes the editors overseeing these publications failed to verify the credibility of the purported evidence or the veracity of the researcher behind it. For example, the headlines of the August 17, 1924 *San Francisco Examiner* (Figure 4) proclaimed in bold print: "WAS THE GARDEN OF EDEN LOCATED IN NEVADA? *Expedition Confirms Finding of Carvings, Possibly Oldest in World*."


News Feature Section

MARCH of EVENTS

San Francisco Examiner

Eminent Writers World Topics

SUNDAY SAN FRANCISCO, AUGUST 17, 1924 SUNDAY

WAS THE GARDEN OF EDEN LOCATED IN NEVADA?

Expedition Confirms Finding of Carvings, Possibly Oldest in World

CRADLE OF CIVILIZATION MAY HAVE BEEN THIS CLOSE TO SAN FRANCISCO

This map is of the land and water as it appears today and as it has appeared since the second upheaval of the Sierras in the Tertiary age. The circle in Nevada marks the spot of "The Examiner's" exploration. Before the upheaval the land between was low rolling hills and the other side, where now is a rock-strewn desert, was covered with forests and semi-tropical growth. Notice that Lake Tahoe and Yosemite are on the map, fit survivors of a vanished Eden.

Evidence Found · SOME INSCRIPTIONS · SHEEP WAS SACRIFICE · Primal Land Old

Figure 4
San Francisco Examiner - August 17, 1924

This *Examiner* headline misled the public into believing the discovery of ancient petroglyphs in the Great Basin region of North America was a larger-than-life event. On each day of the following week, the paper continued to comingle factual information with wildly speculative ideas about the meaning and significance of these glyphs. Like many other publications of that time, this article reflected mostly the principal researcher's anticipatory mindset, as he categorized the glyphs as an assemblage of poorly reproduced Mayan, Babylonian, Arabian, Chaldean, and Egyptian writings.

While the early rock writing researchers quoted by the *San Francisco Examiner* described themselves as independent "discoverer(s) of evidence," they failed to provide any objective evaluation of the individual glyph shapes they were interpreting. Woefully lacking from their analyses were any historically based and proven paradigms justifying the meaning they ascribed to these mysterious depictions.

Unfortunately, even today the best translations many rock art researchers have to offer are their own subjective opinions, mixed with uncertainty. Instead of providing scholarly and objective explanations for the meaning of ancient glyphs, the interpretive schemes employed by most "investigators" lack demonstrable proof, validity and reliability. Like the 1924 *Examiner* article, modern reports often describe rock art using interpretive disclaimers such as: the glyphs "appear to be," "look like," "seem to be," or "resemble" something or other. Such interpretations are based upon personal speculation, vacuous theories, and assumption upon airy assumption.

One major impediment to the proper interpretation of rock writing involves the underlying, and often subconscious, anticipatory mindset of the individual researcher. Numerous psychological studies have established that when people look at images, they tend to perceive patterns based upon their own prior experiences, their present state of mind, and what they currently believe, or have been taught to believe they should be seeing. In psychology, this phenomenon is called apophenia. Such notions can distort and hide from the rock writing investigator even the most basic of epigraphic clues, making a factual evaluation and interpretation of ancient rock writing almost impossible. Instead of presenting an independent and objective justification for the proper interpretation of ancient glyphs, many articles provide the reader with more of a glimpse into the psychological mindset of the researcher than into the intent of the ancient author. It is no wonder that both professional archaeologists and Native Americans have sought to discredit any such "evidence," especially when an outside influence in pre-Columbian America is purportedly involved. Consequently, most North American rock imagery is not clearly understood (Patterson 1992: x).

Many well-intentioned but misguided modern theories for the explanation of ancient rock art utilize generally inadequate and sometimes overly simplistic paradigms (i.e. shamanism, alternative states of consciousness, etc.) to interpret these drawings (Slifer 2000: 4). Those who align themselves with such schools of thought overlook the fact that if the ancient artist-author was preserving the recollection of visions obtained during an altered state of mind, what meaning could the drawings have for a rational viewer in any era? Unfortunately, while rock art is increasingly recorded with accuracy, detail, and rigorous methodology, such has not been the case for its translation. Commenting on the general applicability of shamanistic interpretations to rock art, Bruce Trigger states in *A History of Archaeological Thought* "… arguments that shamanism is universally involved in the rock images produced by hunter-gatherer cultures (Lewis-Williams 2002) appear to require far more substantiation before they can be applied to the interpretation of all such representations (Price 2001; Whitley and Keyser 2003)."

To have widespread applicability and overall validity, interpretive rock art studies must generate outcomes independent from the researcher's own personal "expertise" or prior understandings. Trigger reminds us that the ultimate goal for the field of archaeology "must be to recover knowledge of what has been forgotten" (Trigger 2006: 517). It is essential that research into the meaning of rock art and writing is based upon a robust research methodology that can ensure not only precision in measurement, but also, the use of established evaluation criteria, accurate recording of data, and appropriate interpretive procedures, while ensuring that the researcher is impartial to the outcomes of the study. However, if future interpretive studies are to meet these fundamental research parameters, a new and comprehensive investigative rubric needs to be developed.

Too Much Coincidence is No Coincidence

In their book *Trans-Pacific Echoes & Resonances, Listening Once Again,* noted sinologists Joseph Needham and Gwei-Djen Lu expressed their frustration with the anthropological community's unwillingness to acknowledge the substantial evidence indicating that there was an early Oriental cultural diffusion to the Americas. Together they wrote, "Exactly how specific does something have to be before one acquires the conviction that it must have been transmitted from somewhere else?" (Needham and Lu 1985: 7).

As early as 1759, the respected author Joseph de Guignes detailed the plausibility of an oceanic migration route between Asia and the Americas. Later in 1885, Charles Leland and Edward Vining separately wrote two comprehensive supplemental treatises on this topic. While lacking absolute proof, each of these sea-smart authors made a compelling case for the dispersion of Asiatic people and their inventions to the Americas by the same oceanic route.

More recently, the seminal work of these early theorists has gained support from the nautical endeavors of Thor Heyerdahl in the *Kon-Tiki*; the interpretation of ancient Chinese writings by Henriette Mertz in *Pale Ink*; the analysis of old Chinese maps by both Dr. Hendon Harris, Jr. in *The Asiatic Fathers of America* and that of his daughter Charlotte Harris Rees in *Secret Maps of the Ancient World* and in *Chinese Sailed to America Before Columbus;* and the detailed anthropological investigation by Nancy Yaw Davis documenting the Asiatic origin of the Zuni people in her book titled *The Zuni Enigma*. Applying strict scientific methodologies coupled with rigorous data analysis, these modern researchers have boldly restored the credibility and legitimacy of anthropological investigations into the long-standing historic patterns of exchange that Asiatic people had with the indigenous populations of North America.

In his book, *Asiatic Influences in American Folklore*, Gudmund Hatt documents the exceptionally high number of like elements found in the traditions and folklore of Native American and Asiatic populations (Hatt 1949). Likewise, in *Mexico South,* Miguel Covarrubias describes the curious custom shared by the Chinese and Mayans of placing a small red painted jade bead, carved as a cicada, in the mouth of a deceased person (Covarrubias 1946: 108). In addition, Adams, Garcia, and Lien describe in detail the identical use of over 66 herbal medicines by the Chinese and indigenous Chumash people of California, strongly suggesting that there was an early Asian exchange with Native Americans (Adams et al. 2010: 220). This conclusion is supported by recently published research into the shared customs and linguistics of the Chumash and native Hawaiians (Klar and Jones 2005).

Further, evidence from human DNA research has confirmed that Native Americans share their genetic ancestry with Asian populations (Tamm et al. 2007: e829). In light of this

genetic link, the previously dismissed evidence for an early Asiatic influence in the Americas is now firmly back on the table for discussion. Collectively, the quality and quantity of the factual data published by multidisciplinary researchers on the topic of early trans-Pacific contact, led Joseph Needham to conclude "that between the -7th century and the 16th, i.e. throughout the pre-Columbian ages, occasional visits of Asian people to the Americas took place" (Needham et al. 1971: 545).

If only a fraction of the events described by these authors took place as they report, the Chinese would have significantly influenced Native American populations many years before the arrival of Europeans. Consequently, the presence of Asian-rooted symbolism in the ancient writings of the earliest Americans may be anticipated, and a detailed analysis of the similarities shared by North American rock writing and equally old Chinese script is most appropriate and long overdue.

Fortunately, copies of several ancient Chinese documents, containing the world's oldest continuous account of human history, still exist. These priceless records indicate that in pre-Columbian times, Asiatic contact with the indigenous people of the Americas occurred on at least two separate occasions.

The details for one of these encounters are recorded in the *Shān Hăi Jīng*, written around 300 BC (Birrell 1999: xxxix). This document provides information about a long journey from China across “the Great Eastern Sea” to a far distant land (Vining 1885: 660). In another ancient Chinese document, a legal report ascribed to the year AD 499 and recorded by the Chinese historian Mă Duānlín as *Juăn 327* (scroll #327), there is the description of a journey made by a monk named Huì Shēn to an equally distant land, called Fú Sāng, a place with characteristics similar to those of the Yucatan (Mertz 1953: 57). Both the distances and details given in Huì Shēn's report are considered factually reliable, as Chinese legal documents from this period were written with utmost integrity (See Leland for a translation of the *Juăn 327*). In fact, mistakes or embellishments made by court scribes during this historical period were very serious offenses, warranting equally severe punishment.

More recently, both Harris and Rees have published cartographic evidence for the early exploration of the Americas by Asiatic people. In separate publications, they each present detailed interpretative evaluations for previously unknown ancient maps, along with considerable amounts of supporting ancillary evidence. Both conclude that these old maps preserve illustrations of the Pacific coast of the Americas from pre-Columbian times (Rees 2009: 13).

A Brief History of Chinese Writing

Similar to ancient rock art and writing, Chinese script began around 6600 BC as a pictographic form of communication. Beginning with simple character forms, by 1700 BC Chinese script had evolved into an organized form of writing known today as "oracle-bone script," which was primarily used for the limited purposes of divination (Li et al. 2003: 41). Significantly, by this early date Chinese writing was already highly developed, structurally complex, and widely understood.

During later centuries, the Chinese people increasingly incorporated writing into their culture; and with progress and invention, the need arose to express increasingly complex ideas. Because Chinese is a tonal language, the small number of basic stand-alone symbols originally utilized for documenting simple concepts quickly became insufficient for communicating ever-more complicated ideas. Subsequently, they devised new styles of script to convey abstractions, emotions, descriptors, inventions, and other such terminology. As Chinese scribes modified and embellished the established forms of script, they created a plethora of new symbols, which, unfortunately, were not standardized nor widely understood. This unregulated profusion of characters became such a problem for the average Chinese reader, that in approximately 500 BC, even the learned Confucius complained about how difficult it had become for him to read everyday documents.

By the beginning of the Christian era, over 9000 Chinese characters were in use, a far greater number of symbols than was required for normal discourse. Today, by some accounts, there are over 80,000 uniquely identifiable Chinese written symbols. However, as in the past, the vast majority of these characters are highly specific and of little practical use.

On more than one occasion, Chinese emperors issued imperial decrees demanding that the number of script symbols be reduced to advance national unity. By these proclamations, they sought to regulate and standardize the unbridled development of Chinese writing. Partially in response to these mandates, various modifying phonetic symbols were increasingly paired with the basic semantic pictograms of Chinese writing, as visual cues for pronunciation and for expressing new concepts. With time, the simple images of early Chinese script evolved into more complicated character sets called indicators, ideographs, phonograms, deflectives, and ancillary borrowed forms (Fazzioli 1987: 19).

The most important and long-lasting standardization of written Chinese is the *Shuōwén Jiězì* lexicon, compiled by Xǔ Shèn in approximately AD 120. Although Xǔ did not have access to all of the early script forms, his treatise is the first document employing the line stroke patterns of Chinese script for the purpose of classification. Importantly, all subsequent Chinese dictionaries have followed this organizational paradigm.

As the appearance of Chinese script evolved over time, the basic meaning of the elementary symbols, called "radicals," was generally retained. However, in some cases the form of a radical was incorporated into a new symbol, frequently as an interpretive identifier. In such cases, the inclusion of a radical symbol functions to determine the nature, class, or substance of the overall ideograph. For example, objects made of wood, or originally made of wood, typically include as part of the whole symbol, the radical for a tree, Mù (木). This gives the reader a visual cue that the symbol is somehow to be associated with a tree.

The following chart (Figure 5) displays the character evolution of several Chinese pictograms, beginning with the original pictographic character (right) and ending with its modern equivalent (left). Note how the original form of each character resembles a simple drawing of the intended object.

English Meaning (Chinese)	Modern character	Seal era style	← Newer forms	Probable original	Remarks
Water (shui)	水	水			Ripples on water
Pool (yuan)	淵	淵			Pool to which water has been added
Boat (zhou)	舟	舟			A ship with sail; diagram of a boat
Tree (mu)	木	木			The symbol for a plant with roots below
Fruit tree (guo)	果	果			Tree to which fruit has been added
Thorns (ci)	朿	朿			Thorns on a tree
Large tree (wei)	未	未			Tree in full leaf and branch
Field (tian)	田	田			Field subdivided

Figure 5
Evolution of Selected Chinese Pictograms
Adapted from: *Early Chinese Writing* by Frank Chalfant

Similarly, with compound imagery the Chinese ideograph Qī depicts the sap from a tree (Figure 6), by artistically joining the symbol for a tree, Mù, with the symbol for rain, Yǔ. In this manner, the Mù portion of the combined image informs the reader that the item is related to a tree, and the recognizable aspects of Yǔ convey the notion of liquid drops. However, to interpret more complicated Chinese ideographs, such as those embellished by a modifying phonetic symbol (which imparts a particular sound to the image), the reader must have significantly greater knowledge about the meaning for the interactive elements of Chinese script.

Mù (tree) + Yǔ (rain) = Qī (tree sap)

Figure 6: Derivation of the ideograph Qī, meaning “tree sap”
Images: Frank Chalfant

Today Chinese writing is organized around a set of two hundred and twenty-six radicals preserved from the five hundred and forty symbols (termed "primitives" or "classifiers") which were recorded in the *Shuōwén Jiězì* . However, the meaning associated with many modern radicals is not directly connected with their ancestral forms and are sometimes at variance with earlier translations. This stylization of modern Chinese writing is largely because of the accidental transition of many of the fundamental symbols over time, as they evolved from widely dissimilar root forms. One example of such an incongruity involves the current set of ideographs derived from the forty-fourth radical, Shī (尸). The root meaning of this radical is “corpse,” yet in modern times, very few of the words derived from this fundamental radical have anything to do with death or a dead body.

In 1906, Reverend Frank Chalfant wrote an article titled *Early Chinese Writing* in which he documented the historical development of numerous Chinese script symbols. This work has withstood the test of time and is still considered by many to be one of the best historical commentaries on the evolution of Chinese characters. Significantly, Chalfant attributes most of the changes in the form of these written symbols to the demands imposed by advances in the technologies used for calligraphy and printing, along with the need to convey increasingly complex concepts. The following list provides a brief description of the four major historical styles of Chinese script.

Jiă-gŭ-wén, or oracle-bone script (before 1400 BC to 1045 BC): This is the earliest known form of Chinese writing. The shapes utilized in this form of script are highly pictographic, illustrating the items they represent. As a major advance in expression, this is the first script to utilize combinations of pictographs to record complex meanings.

Dà-zhuàn, or greater seal script (1100 BC to 221 BC): This is a modified form of pictographic writing that is found almost exclusively on ancient cast bronze items.

Xiăo-zhuàn, or small seal script (221 BC to AD 420): These essentially pictographic ideographs are more abstract than are the previous forms of Chinese writing. As a group, they constitute the basis for the modern character forms.

Lì-shū, or clerical script (AD 200 to the present): This form of Chinese writing retains many of the basic elements of small seal script, but the characters are easier to draw, more rectangular, and more compatible with newer print technologies. By about AD 750, a slightly altered form of clerical script, known as standard or regular script, came into widespread use. Since then this script has remained essentially unchanged and is still a preferred writing style in China (Rohsenow 2004: 34).

A Robust Rubric for Interpreting Rock Writing

Substantial Similarity
An Established Method for Comparing Images

When viewing representational forms of rock art, it is sometimes possible to comprehend, with a fair degree of certainty, the meaning of an ancient drawing. The depiction of an identifiable animal, a familiar object, or an upside-down person with spears and arrows piercing the body may be properly understood in any era by even a casual observer. Nevertheless, such explanations for the meaning of many glyphs generally lack the quantifiable means to be truly convincing when they are subjected to more rigorous analysis.

One major problem in any interpretive endeavor is that the anticipatory mindset of the observer can prevent the proper recognition of symbolically encoded information, thereby reducing any subsequent translation to little more than idle speculation. Some highly educated rock art enthusiasts have gone so far in this direction, being engrossed in their own thoughts, that they have published schemes for interpreting rock writing based solely upon a comparison of the ancient glyphs with images generated in modern high-energy particle physics laboratories (Peratt 2003). Such bizarre interpretive schemes accentuate the need for properly identifying, quantifying, and evaluating the visual cues embedded in ancient rock depictions prior to attempting any interpretation.

Recovering the intellectual information encoded in ancient rock writing necessitates the development of a comprehensive interpretive epigraphic rubric. If such an evaluative construct is to possess validity, it must simultaneously: control for the inherent biases of the researcher; diminish the likelihood of making a false positive translation; and maximize the sensitivity of the data collection process, so that meaningful information encoded in the features of a glyph is not overlooked (discernment). Unfortunately, most published rock writing translations have failed to employ such a robust interpretive paradigm. Consequently, there is a lack of conclusive and independently verifiable interpretations for almost all ancient rock writing.

In the legal community, proving that two works of art share a demonstrable "substantial similarity" forms the basis for adjudicating cases of alleged artistic copyright violation. Substantial similarity, a term used in copyright and patent law, may be defined as it was in the case of Ideal Toy Corp. v. Fab-Lu Limited, 360 F.2d 1021, 1022 (2d Cir. 1966) “whether the average lay observer would recognize the alleged copy as having been appropriated from the copyrighted work.” Likewise, in the case of Boisson v. Banian, Ltd. 273 F.3d 262, (2nd Cir. 2001) substantial similarity was described as: “if the ordinary observer, unless he set out to detect the disparities, would be disposed to overlook them, and regard their appeal as the same.” On a more quantitative level, proof of substantial similarity was upheld in the case of Designers Guild Limited v. Russell Williams Limited, Designers Guild Ltd. [2001] 1 WLR 2416, when the judge supported a claim for violation of copyright after identifying seven important similarities between two works of art.

As mentioned above, both North American rock writing and early Chinese script are highly pictographic. Consequently, when it can be demonstrated that unique pairings of equally old and complex images from these two sets of symbols are substantially similar, and the probability for their chance likeness is determined to be insignificant, then with mathematical certainty the origin for some North American rock writing may properly be ascribed to early styles of Chinese script.

Line Strokes - The Components of a Script Symbol

With limited variation, all forms of script are composed of basic elements called line strokes. In any language, these lines may be written using a brush, chisel, pen, pencil, chalk, or almost anything else, to construct a uniquely recognizable figure with an attached meaning. In English, these symbols are the alphabetic letters of the language.

In Chinese, which does not have an alphabet, the images used for writing are classified based upon both the form and number of their line strokes. For modern Chinese writing, a group of 214 unique characters called "radicals" provides the basis for classifying script characters, as each Chinese character stems from one of these 214 elementary symbols.

While each unique form of writing requires a particular set of line strokes for its construction, far from being complicated, many modern Chinese script symbols necessitate the use of only eight line strokes for their construction (Guo 1995: 21). These line strokes are: dot, dash, perpendicular, left-falling, right-falling, hook, upstroke to the right, and bend (Table 1). Still, for creating some of the more flamboyant Chinese scripts, as many as thirty-two unique brush strokes may be required (Fazzioli 1987: 19).

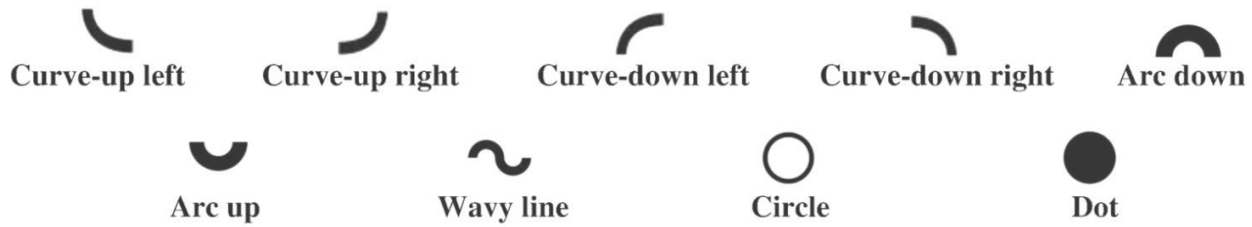
Table 1
Eight Basic Chinese Line Strokes

Similarly, block letter Roman script requires a basic set of six line strokes for creating its characters (US Army 1994: 20). These strokes are: right curve, left curve, diagonal down**,** diagonal up, horizontal, and vertical (Table 2).

Table 2
Six Basic Roman Line Strokes

Because the Chinese pictograms and North American petroglyphs evaluated in this study are comprised of relatively simplistic linear and curved lines, the basic set of Roman line strokes was adopted for describing the features of these characters. Furthermore, to enhance the descriptive specificity of these pictograms and glyphs, the following supplementary line strokes were also utilized, as required: curve-up left, curve-up right, curve-down left, curve-down right, arc down, arc up, wavy line, circle, and dot (Table 3).

Table 3
Additional Line Strokes



Line Stroke Relations

In addition to the number and form of the line strokes used for writing Chinese characters and North American glyphs, each of their lines must be placed at a predetermined location within the figure, or the meaning of the overall pattern may not be decipherable by the reader. Defining the attributes of line strokes involves not only the form of each stroke, but also its length, orientation (horizontal, vertical, left-slant, and right-slant), and inter-stroke touch relations. Describing the inter-stroke relations of a line stroke requires

making a determination of its relative positioning (above, below, left, or right), and the form of its touch relationships (intersection (+), parallel (||), end connection (∟), and junction (┬) (Liu et al. 2001: 2341). This established set of interpretive inter-stroke relationship descriptors was utilized in this study.

Finally, in most forms of script, line strokes are written vertically downward. Therefore, for the descriptive purposes of this study individual line strokes are interpreted as beginning with the highest portion of each line (top) and ending at its lowest point (bottom). Similarly, horizontal line strokes and line stroke clusters are described from the perspective of the reader, beginning on the reader's right (start) and finishing on the reader's left (end). The single exception for the general applicability of these two interpretive line stroke protocols is when the features of a particular line indicate that the author's intention was that it be read in a clearly different manner, such as by the intentional orientation of a pointed arrow.

Measuring the Similarity of Line Stroke Features

For identifying Chinese scripts in North American rock writing, a statistical comparison of both the line strokes and inter-stroke touch relationships utilized for writing Chinese pictograms and equally old North American glyphs with the same visual appeal, was conducted.

Prior to calculating the level of similarity for each of this study's pictogram-glyph pairings, a separate inventory of the line strokes and inter-stroke touch relations for each unique glyph and corresponding Chinese pictogram was created. The complementary features of these two data sets were then placed, side-by-side, for comparative analysis (Appendix A). Subsequently, the attributes of each pictogram-glyph pairing were recorded as binary data, with a "yes" in cases of perfect agreement, and a "no" for instances where the analyzed features did not perfectly coincide, or when a corresponding item is missing from one of the two data sets.

To quantify the similarity of the study's pictogram-glyph analyses, Jaccard's Index of Similarity (*J*), one of the most useful and widely applied indices for assessing the significance of binary data (Birks 1987: 168), was utilized. As a statistical instrument, Jaccard's Index is frequently employed in the biological sciences for assessing the degree of similarity between paired sets of descriptive data.

Mathematically, J values are defined as the number of attributes (S) shared by two sets of data, divided by the combined total number of attributes (N) identified in both data sets.

$$J = \frac{S}{N}$$

Alternatively, Jaccard's Index (J) may be calculated using the following formula,

$$J = \frac{M_{11}}{M_{10} + M_{01} + M_{11}}$$

where M_{10} is the number of attributes unique to item A, M_{01} is the number of attributes unique to item B, and M_{11} is the total number of attributes shared by items A and B.

Identifying Meaningful Comparisons

In 1980, Cesare Baroni-Urbani published a mathematical table listing significant values for Jaccard's Index of Similarity, which he generated by running a randomization test for the statistical parameters of the Index. In this seminal work, he calculated the probability (P) for obtaining values of Jaccard's Index solely by chance, based, in part, upon the total number of features being compared. Several years later, in 1996, Raimundo Real and Juan Vargas improved upon the work of Baroni-Urbani; and in 1999, by using computer generated values for all possible combinations of paired data, Real was able to publish a corrected set of P values for Jaccard's Index (Real 1999: 31-33).

For Jaccard's Index of Similarity, Appendix C lists the significant values calculated by Real for confidence limits of 0.05, 0.01, and 0.001, when any possible distribution of the total number of elements (N) is possible. Importantly, in such instances the probability values, P, associated with values of J, depend only upon the combined total number of attributes. (Note: the P values calculated for Jaccard's Index of Similarity are not to be confused with statistical "p-values.")

To test the efficacy of Jaccard's Index of Similarity for assessing the similarity of Chinese pictograms and North American rock writing, the line stroke features of an oracle-bone Mù pictogram (Appendix A, Chart 14) were compared with those of a written Mù character published by Frank Chalfant in his treatise *Early Chinese Writing*. The values for Jaccard's Index of Similarity generated by this process ($J = 1.000$ and $P < 0.001$) indicate that these two Mù characters are statistically identical, which, in this case, is a known fact.

This comparative analysis confirms the validity of using Jaccard's Index of Similarity for measuring the significance of the study's Chinese pictogram and North American glyph comparative data. Subsequently, each of the study's 107 pictogram-glyph comparisons is associated with corresponding values for J and P. Each of these calculations is presented separately, along with detailed line stroke descriptions, in Appendix A. When viewing this data, the reader is reminded that while higher values of J indicate greater overall similarity, greater P values indicate that any measured similarity is less reliable.

Statistical Design and Significance

Setting an acceptable level for the mathematical significance of scientific data is a somewhat arbitrary endeavor. Most commonly, research findings are rejected whenever the study result might be due to a chance event five percent or more of the time (Olson and Olson 2000: 66). Consequently, a ninety-five percent confidence level threshold was employed in this study as the critical value of significance for each of the study's pictogram-glyph comparisons. Subsequently, pairings associated with P levels equal to or less than five percent ($P \leq 0.05$) are considered in this report to be "substantially similar."

However, when comparing highly variable items using Jaccard's Index of Similarity, such as individualized styles of script, lower values of *J* do not always indicate a lack of relationship. Like today, ancient writers frequently customized the form of their script while still making it readable. The large number of printing fonts available on a modern computer is a good example of such epigraphic variability. In his book on Chinese calligraphy, Fazzioli states that:

> *"Although preserving the basic formed characteristics that allow us to grasp its meaning, every (Chinese) character can be written in a variety of ways. Its appearance is linked to the instrument with which it is written, to the material on which it is inscribed and, above all, to the technical ability and artistic sense of the individual calligrapher. Every Chinese knows that calligraphy is a key to reading the scribe; each character reveals not only the style but also the background, the skill, the mind and the passions of the person who produces it. There are styles with narrow, thick, regular, irregular, intense or light lines; others are squared, fine, elongated, horizontal, soft, stiff or sinuous. All this and more determine calligraphic style. Precisely because they are linked to the personality of the writer, many different styles of calligraphy have emerged over the centuries and still continue to develop today; they represent the individual touch, the artistic genius of certain men"* (Fazzioli 1987: 16-17).

In the same way that the large number of fonts available on a computer encourages modern writers to vary the style of the script they use, ancient Chinese scribes also frequently altered the shape of their written imagery, making the standardization of script, then as now, more of a concept than a reality. Consequently, author-induced variability in the attributes of both Chinese pictograms and rock writing glyphs must be anticipated. For the comparative purposes of this epigraphic study, lower values of Jaccard's Index of Similarity are not always indicative of a lesser relationship for a pictogram-glyph analysis. With the Chinese people, art and writing merge.

Nevertheless, a highly conservative definition for the line stroke and inter-stroke relations of each study character was utilized for calculating the level of similarity shared by each of the study's glyphs with those of a known ancient Chinese pictogram. This strict study protocol was adopted so that the values generated by Jaccard's Index would not become skewed, plus or minus, by the listing of unnecessary partial line stroke features. For

example, circles are always listed as single items in the study data, rather than as a combination of separate arcs.

Additionally, for some of their glyphs, ancient Native authors employed representational imagery, such as anthropomorphs and line clusters, not found in this study's set of ancient Chinese pictograms. Therefore, for comparing these complex features, the same conservative evaluative protocol used for describing line strokes was applied. Single descriptors were employed for labeling such complicated patterns, again, to avoid overweighting these items in the formula used for calculating values of Jaccard's Index of Similarity, and subsequently biasing the calculated values generated for each of the pictogram-glyph combinations.

Identical evaluative constructs were utilized for comparing the inter-stroke touch relations of each pictogram-glyph. Like atypical line strokes, unorthodox inter-stroke relationships were also included in this analysis. However, to avoid overstating the similarity of pictogram-glyph inter-stroke touch relationships, by "double counting," these features were not considered the same unless they were identical. Consequently, the values of Jaccard's Index of Similarity presented in this report conservatively measure the overall sameness of the study's pictograms and glyphs.

Finally, a robust research design must be able to exclude from consideration items that appear to belong in the study, but which, in reality, are unrelated. To diminish the likelihood of assigning meaning to the spurious congruence of a Chinese pictogram and North American glyph, petroglyphs and pictographs similar in appearance to Chinese pictograms, yet dated to a time before the invention of the matching pictogram's style, were excluded from the database. Conversely, petroglyphs and pictographs independently dated to times that are more recent were not excluded, as a style of script may continue to be used long after a literate population has embraced its replacement. An example of such epigraphic persistence is the ongoing use of Roman numerals in modern times. Consequently, to meet this research requirement the relevant imagery at each of the study sites have been independently dated to pre-Columbian times (Appendix B).

Rock Art Boat Drawings

Around the world, numerous rock art depictions of ancient boats have been identified. Many of these drawings are over a thousand years old and are clearly discernible as watercraft, embellished by such identifiable nautical features as sails, oars, and rudders. Sometimes, and especially in drier regions of the world, such as the American Southwest, the ancient artists reinforced the meaning of their nautical depictions by placing the boats upon, or directly connected to, wavy water lines. Some of these ancient drawings depict boats with semi-circular shaped hulls and flat deck surfaces. In many cases, rock art boats also include an illustration of the people riding upon the vessel. Frequently these maritime passengers were drawn as vertical lines emanating from the boat's deck (Figures 7-11), but sometimes they appear with more detail, as animated rock art stickmen (Figure 12).

Figure 7
Boat with people
Little Lake, California

Figure 8
Two boats on water with people
Natural Bridges National Monument, Utah

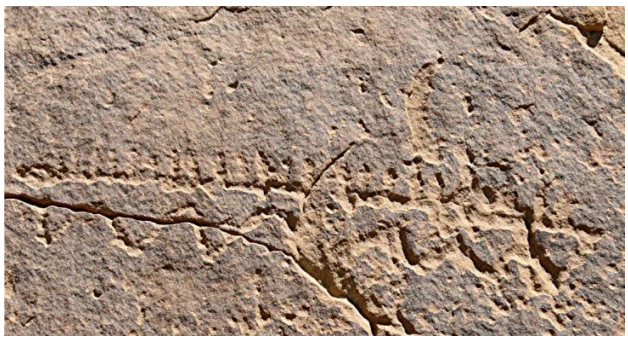


Figure 9
A boat with many people on water
Chaco Canyon, New Mexico

Figure 10
Boat with people on water
Pictograph Cove, California

When an ancient boat glyph is particularly well drawn, it is often possible to discern the craft's unique nautical features. In such instances, these characteristics can provide valuable information about the vessel's relative dimensions and the shape of its bow and stern (Figures 10, 11 and 12). In one highly detailed depiction (Figure 13), the ancient artist even drew each of the passengers holding an oar. Nevertheless, most boat glyphs reveal very little additional information about the structure of the vessel or the people who traveled upon it.

Figure 11
Boat petroglyph
Petroglyphs Provincial Park, Ontario

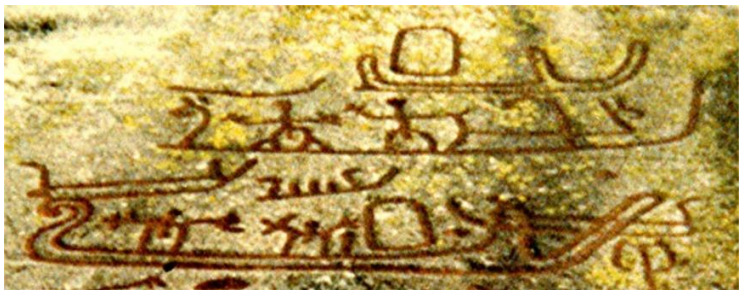


Figure 12
Boat petroglyphs
Sarpsborg, Norway

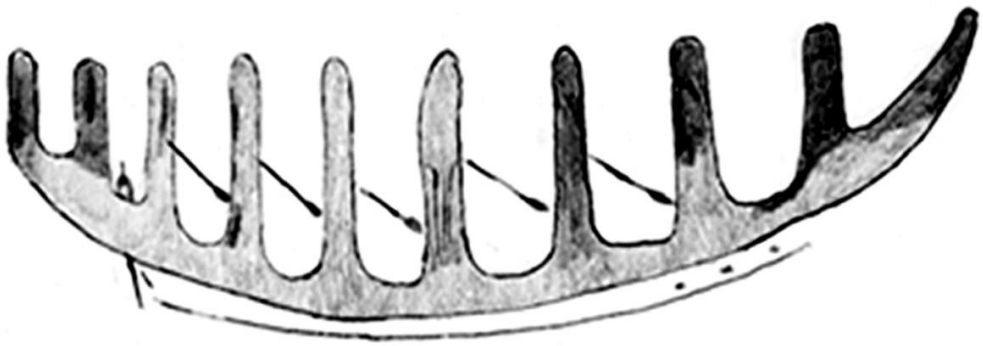


Figure 13
Sketch of a boat glyph illustrating people holding oars - Eagle Cave, Texas
Drawing: Jennifer Mucha

The unusually detailed pre-Columbian boat petroglyphs located at the Three Rivers Petroglyph Park in New Mexico (Figure 14) are of particular interest. These images portray boats with sizable hulls, masts, and a form of sail unknown in the Americas in pre-Columbian times. The nautical detail recorded by the artist is remarkable, as he also included the depiction of a highly active "waving-man" sailor standing on the larger boat's stern deck. Curiously, these sailboat drawings have been dated to around AD 1000 (Bureau of Land Management 1995: 1), a time when vessels like these were unknown in the Americas. Significantly, these petroglyphs are located in the desert over 500 miles from the nearest ocean or large body of water.

Figure 14
Sailboat petroglyphs at Three Rivers Petroglyph Park, New Mexico

One local suggestion for the meaning of the Three Rivers sailboats is that the ancient people of the Water Clan, who are known to have lived at this location, drew them as a visual remembrance of their own folklore, describing their journey to this continent by island-hopping across the western (Pacific) ocean on boats or rafts (Sanders 2008: 12). Unfortunately, this explanation stops short of suggesting who actually made this sea voyage or during what time it might have taken place.

Nevertheless, three significant components of the sailboat images at Three Rivers, New Mexico provide valuable clues for understanding the meaning, and likely origin, of these drawings. First, the arc of the sail shown on the larger boat is characteristic of a quadrilateral lugsail design (Figure 15). This is a style of sail that was not used on European watercraft a thousand years ago, but it was employed on Chinese vessels as early as the +3rd century (Needham et al. 1971: 613). Second, both of these boats have elevated bows, sharply angled sterns, and the ratio of the length of their hulls to the height of their masts indicates that these vessels were constructed from wooden planks. Significantly, this method for making watercraft was totally unknown by Native Americans, save for the Chumash people of California, who fabricated only small fishing boats in this manner. However, historical records indicate that wooden planks were engineered specifically for building boats in China as early as 2000 BC.

Finally, below the stern of the larger sailboat a secondary image depicts, in detail, the boat's rudder. Significantly, this drawing has the characteristics of a balanced rudder (Figure 16), a nautical design invented by the Chinese prior to AD 951 (Needham et al. 1971: 649) and which was not employed on European ships before the 19th century (White 1894: 666). The likeness of the features of this rock art rudder with those of a Chinese balanced rudder (Figure 17), and with the exposed portion of the fenestrated rudder on a late 19th century Chinese sailboat (Figure 18), is remarkable. Nevertheless, why would anyone draw such a detailed picture of advanced maritime construction at a site in the New Mexico desert, far from any large body of water, a thousand years ago? Moreover, if these glyphs are as old as they are purported to be, who outside of Asia had knowledge of such an advanced rudder design so long ago? Certainly, these two Three Rivers Petroglyph Park sailboat depictions are an enigma, unless further evidence for an Asiatic presence in this region of the world, a millennium ago, can be demonstrated.

Figure 15
Sailboat petroglyph
Three Rivers Petroglyph Park, New Mexico

Figure 16
The balanced rudder glyph

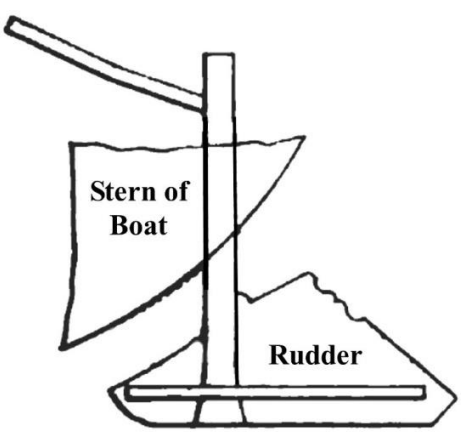


Figure 17
Chinese balanced rudder design
Diagram: F. P. Warren

Figure 18
Chinese sailboat with a fenestrated rudder
Photo: Herbert Ponting

Chinese Pictograms in North American Rock Writing

Boats and Water

Numerous Native American rock art depictions of boats, water, lakes, and fish have been identified at scattered sites across the North American continent. Many of these are artistic drawings; however, some were created using readable ancient Chinese script pictograms. Importantly, the historic style of Chinese writing employed by these ancient authors can be dated and is readable. Various examples of such ancient Chinese rock writing are located in the American Southwest where the climate favors preservation, but other specimens have been identified east of the Mississippi River, and north of Toronto, Canada.

One the most significant of these early written symbols is the oracle-bone era Chinese pictogram for a boat, Zhōu. In the North American rock writing record Zhōu pictograms are characteristically embellished by one or more wavy lines, informing the reader that this symbol is to be associated with water (Figure 19). In addition, all of the evolutionary forms of the Zhōu symbol have long, ladder-like sidelines, similar to the extended strakes found on many ancient boats (Figure 20), which extend beyond the vessel's last transverse crossbar, the stern of the craft.

Figure 19
An oracle-bone style Zhōu (boat) petroglyph showing the attached wavy water line
Near Sedona, Arizona

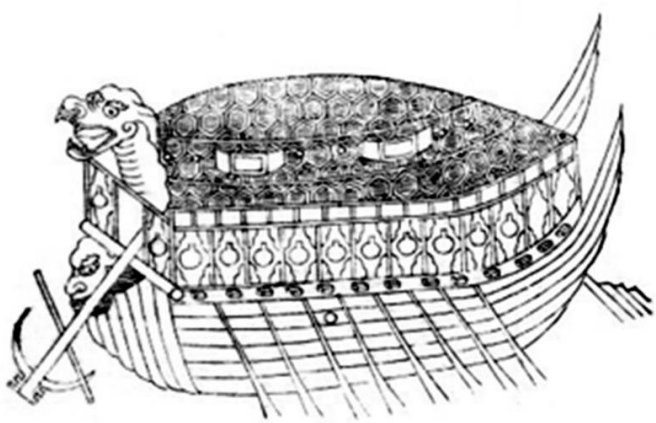
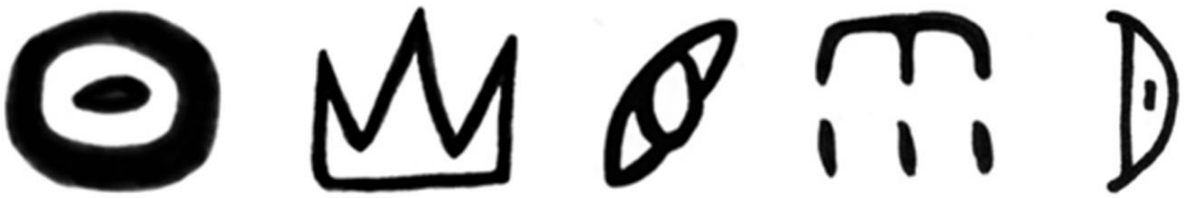


Figure 20
Sketch of a 16th century Korean warship with large upwardly curving extended side strakes
From: *Yi Chungmu Kong choonso* [The Works of Admiral Yi Sun-Shin]

Characteristics of Oracle-bone Zhōu pictograms

As outlined above, the earliest style of organized Chinese writing, oracle-bone script, was carved into animal bones, for the purposes of divination. These characters look like what they represent (Figure 21).



Sun Mountains Eye Rain Moon

Figure 21
Oracle-bone script characters

For communicating the concept of a boat, Zhōu, the oracle-bone style of this character used a diagrammatic representation of the nautical features found on a small water vessel, such as a rowboat or canoe, to convey its meaning. Two slightly curved and extended sidelines were employed to depict the boat's rounded hull, and connecting multiple transverse lines were used to illustrate the supporting crossbars (thwarts) of the vessel (Figure 31). When these features are observed in rock art, especially in a desert setting, they may appear to a casual observer as a ladder, rather than as something nautical. Unfortunately, many interpretive rock art paradigms perpetuate this interpretive error.

However, because of the unregulated evolution of Chinese writing, there is considerable variation in the forms of oracle-bone script, and also in later styles of Chinese writing. For example, oracle-bone script Zhōu (boat) pictograms were typically written with gently curved sidelines, connected by two, three, or four horizontal thwart lines, evenly spaced or not (Figure 22). Such dissimilarities reflect the evolutionary nature of early Chinese writing and have been interpreted by David N. Keightley, one of the world's foremost authorities on early Chinese writing (Eno 2010: 2), as stylistic variations created by different authors, which provide no known additional meaning to the pictogram.

A B C D E

Figure 22
Oracle-bone Zhōu (boat) pictograms
Images: Bernhard Karlgren

An Important Message at El Morro

El Morro National Monument, in New Mexico, is well known for the numerous historical messages and signatures carved into its soft sandstone cliffs. Here you can find the names and notes left by early European explorers written alongside ancient Native symbolism. Not to be overlooked is the remarkable image of a Chinese oracle-bone script Zhōu (boat) petroglyph, connected to a single wavy line (Figure 23). Like an oracle-bone pictogram of Zhōu, both ends of this glyph's sidelines extend beyond the image's complement of connecting crossbars. When compared, the line stroke features of this glyph are substantially similar (J = 0.8824; P < 0.001) with those of an oracle-bone era Zhōu pictogram. In fact, the characteristics of these two written images are almost identical. The Native glyphs at this site are estimated to have been created between AD 1000 and AD 1300.

Plain photograph Figure 23 Photo with trace lines
Zhōu petroglyph at El Morro National Monument, New Mexico
Appendix A, Chart 1

A Large Boat Pictogram at Lagomarsino

South of Reno, Nevada, in the wild open range countryside, there is a four-foot tall petroglyph carved upon a large boulder. Located just below the rim of a volcanic ridge, this image looks very much like an extension ladder set against the rock, with an additional "rung" joining the top of its vertical sidelines (Figure 24). Two unmistakable wavy water lines emanate from the left side of this figure, indicating that the story it tells has something to do with a significant quantity of water.

Estimated dates for the creation of the glyphs at Lagomarsino range from as early as 3000 BC to as recently as AD 600. This era overlaps with the time when oracle-bone script

was widely utilized in Asia, and the line strokes and inter-stroke relations of this glyph are substantially similar to those of a Chinese oracle-bone Zhōu pictogram ($J = 0.7500$; $P < 0.001$). Consequently, this petroglyph is identified as a Chinese Zhōu pictogram, documenting a nautical story.

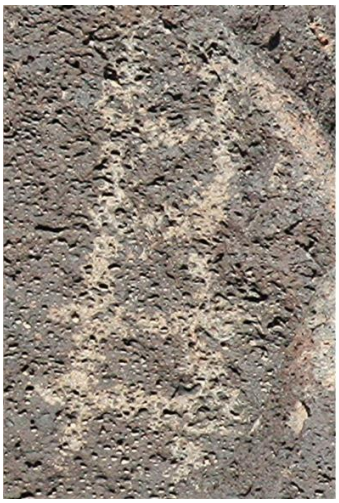
Plain photograph

Photo with trace lines

Figure 24
Zhōu petroglyph at Lagomarsino, Nevada
Appendix A, Chart 2

A Chinese Zhōu Pictogram with a Story to Tell

At an ancient sacred astronomical site in the Piedras Marcadas Canyon section of Petroglyph National Monument, in Albuquerque, New Mexico, resides another petroglyph (Figure 25) that is substantially similar to an oracle-bone style Zhōu pictogram ($J = 0.7647$; $P = 0.001$). Extending from the top right sideline of this figure and continuing across the full breadth of an adjoining surface of this boulder, is a long and periodically wavy meander line, indicating that the object represented by this pictogram is to be associated with an extensive amount of water (Figure 103). Three glyphs, substantially similar to the Chinese pictograms Tián, Guǒ, and Chè (Appendix A, Charts 22, 25, and 54) are also pecked into this boulder's surface immediately alongside this Zhōu-like glyph (Figure 101). The proximity of these three figures supports the identification of this particular petroglyph as a Chinese Zhōu pictogram. The National Park Service dates many of the glyphs at Piedras Marcadas Canyon to around AD 500, and the most recent to near AD 1680. However, some are considerably older.



Plain Photo

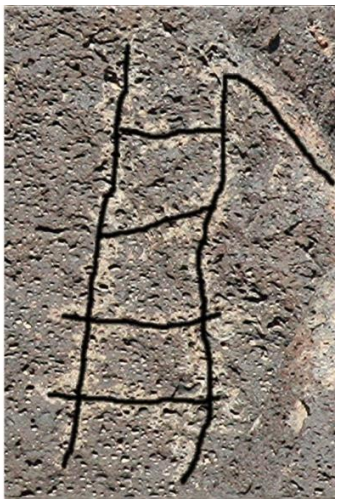


Photo with trace lines

Figure 25
Zhōu petroglyph at Piedras Marcadas Canyon
Appendix A, Chart 3

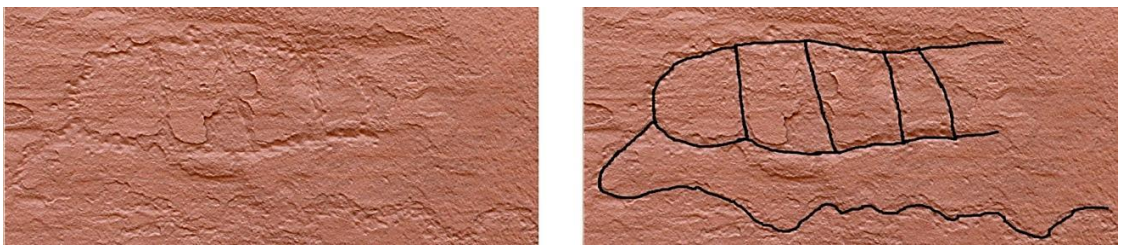
Side-by-side Boat glyphs

Pecked into the sandstone of Kachina Bridge, in Natural Bridges National Monument, Utah, is an ancient drawing of particular interest (Figure 26). When the line strokes of this image are compared with those of an oracle-bone Zhōu character the following points of similarity are evident. First, the exterior of both symbols consists of two parallel sidelines. Second, in each of these characters there are four evenly spaced transverse lines connecting the two sidelines. Third, the sidelines of each figure continue beyond the last transverse connecting line, in an open manner reminiscent of the long side strakes that extend beyond the stern of ancient boats. In addition, like a small seal Zhōu character, this glyph has a wavy line attached to the top portion (bow end) of the figure.

This Kachina Bridge petroglyph shares fifteen out of twenty identifiable line stroke features with an oracle-bone style Chinese Zhōu pictogram (Appendix A, Chart 4). The values obtained by use of Jaccard's Index of Similarity for comparing this glyph's line stroke features to those of this oracle-bone Zhōu pictogram verify the substantial similarity of these two characters ($J = 0.7500$; $P < 0.001$).

In addition, the wavy line emanating from the bow portion of this petroglyph bends beneath it, and then continues for a great distance across this rock panel as a line of water. Significantly, this pictogram was written horizontally, to emphasize that it is to be interpreted as a boat floating upon wavy water. Collectively, the estimated age for the glyphs on Kachina Bridge, the known dates for the common use of oracle-bone script in China, and the high degree of similarity this glyph shares with a Zhōu pictogram identify it as pre-Columbian Chinese script.

Importantly, evidence supporting a nautical interpretation for this petroglyph is located nearby. Here on the same panel of rock art are the profile images of several ancient boats, floating upon a similar extensive wavy water line. Rising vertically from the top side of these images are multiple vertical lines (Figure 8), such as are frequently used in Native artwork for representing the boat's passengers. Both of these side-by-side rock panel depictions record a nautical story, however, one employs artwork to relate its story while the other uses Chinese script. The glyphs at this site are estimated to be between 750 and 2000 years old, and although this Zhōu pictogram was carved on a protected surface beneath this large bridge, it exhibits considerable weathering.



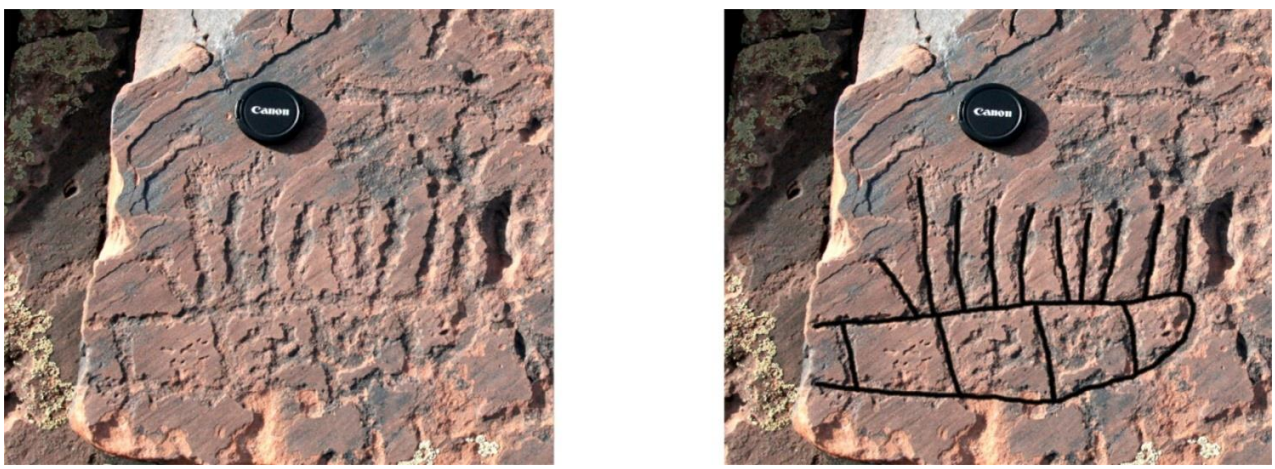
Plain photograph Figure 26 Photo with trace lines
Zhōu petroglyph at Kachina Bridge, Natural Bridges National Monument, Utah
Appendix A, Chart 4

Aboard the Zhōu Pictogram at Lyman Lake State Park

On the top of a hill, overlooking the Little Colorado River in Lyman Lake State Park, Arizona, is an extensively weathered Zhōu-like petroglyph (Figure 27). Similar to the Chinese writing on Kachina Bridge described above, this image also shares fifteen of eighteen of its line stroke features with an oracle-bone era Zhōu pictogram (Appendix A, Chart 5). It has the same shape as the Kachina Bridge Zhōu pictogram, but in addition, and most importantly, numerous lines project at right angles from only one of its sidelines. These protruding lines are much the same as the embellishing lines found on a well-researched and understood ancient Eagle Cave, Texas, boat pictograph (Figure 13). On the Eagle Cave drawing, each of these lines attaches with an oar, confirming that these lines depict people rowing a boat (Grieder 1966: 718). Numerous and unrelated ancient nautical images make use of similar lines to portray passengers (Figures 7-11).

Most importantly, the established interpretation for the attachment of such multiple short lines to the Eagle Cave image of a boat confirms that a similar nautical explanation for this bilingual Lyman Lake petroglyph is appropriate. By embellishing what is clearly a drawing of a Chinese Zhōu pictogram with these additional lines, the ancient author of this petroglyph uniquely employed elements from two separate pictographic languages, Chinese and Native American, to both illustrate and write a message about “people on a boat."

Many of the petroglyphs at Lyman Lake are estimated to be from 300 to 700 years old, yet a few may be considerably older, created around 6000 BC. Based upon the estimated age of this petroglyph (see Appendix B), and the substantial similarity of its line strokes with an oracle-bone Zhōu pictogram ($J = 0.8333$; $P < 0.001$), it is identified as pre-Columbian Chinese script. Unfortunately, no independent estimate for the age of this glyph has been made, in part due to its highly degraded condition, and its location upon an exposed surface where it is subjected to extreme summer temperature variations and in winter is frequently covered by ice.



Plain photograph Figure 27 Photo with trace lines
Zhōu petroglyph at Lyman Lake State Park
Appendix A, Chart 5

A Traveling Zhōu Pictogram

In the parking lot of the South Mountain Ranger Station in Phoenix, Arizona, is a boulder covered with numerous faded petroglyphs (Figure 28). Transported many years ago from near Arlington, Arizona, about 50 miles distant, this is a very curious monument. A large spiral and many other curvilinear lines are easily discerned on the face of this large rock. Most importantly, there is a wide wavy line that snakes its way down the surface of this boulder, which at one point connects with the end of a vertical sideline of an oracle-bone style Zhōu pictogram. Although greatly faded, visual and statistical evaluations of the line stroke features of this petroglyph indicate that it is substantially similar to an oracle-bone script Zhōu pictogram ($J = 0.7500$; $P < 0.001$). The estimated dates for the creation of the images on this boulder range from AD 750 to AD 950.

Plain photograph

Photo with trace lines

Figure 28
Zhōu petroglyph near Arlington, Arizona
Appendix A, Chart 6

Transitional Forms of Zhōu Pictograms and Glyphs

With time, the original rectilinear shape of the oracle-bone era Chinese Zhōu pictogram morphed into a curvilinear style of writing, which today is termed Dàzhuàn, or greater seal script. This style of Chinese script became popular around 1100 BC and remained the preferred form of writing in China for the next 900 years. Today, examples of these modified symbols are almost exclusively found on ancient bronze vessels from that era (Figure 29).

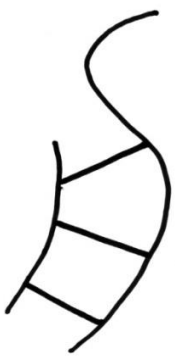


Figure 29
Greater seal script Zhōu pictogram, ca. 400 BC
Image: Bernhard Karlgren

By 221 BC, the time of the Ch'in (Qin) dynasty, a newer form of Chinese writing called Xiăozhuàn, or small seal script, supplanted what was by then the older greater seal style. In *Early Chinese Writing*, Frank Chalfant clearly identifies the era during which small seal script was the predominant style of script in China. He wrote:

> *"...modern editions show the old symbols analyzed by the author Hsu in the style called 'Small seal'—a refined form developed during the Han Dynasty (B. C. 206-A. D. 264)."*

Chalfant also stated:

> "*The hair-pencil on paper did not lend itself readily to these shapes, and we find the 'square character' in the ascendency until it entirely supplanted the older system of 'seal character' about A. D. 400. This change in penmanship so modified the appearance of the written signs as to greatly obscure and almost obliterate their pictorial character*."

Here Chalfant informs us that, like its predecessors, by AD 400 small seal script was itself supplanted by an even newer form of Chinese writing. The dates he gives for the common usage of small seal script in China provide a means for estimating when Chinese small seal script could have been transmitted to North America. If Chalfant's history of Chinese writing is correct, North American small seal style Chinese glyphs could not have been created before 206 BC, and allowing for the transmission, integration, and persistence of this style of script, not too many years after AD 400. Significantly, this date range overlaps the time period modern archaeologists assign to the rock art imagery near Lyman Lake, AD 300 to AD 700 (Lyman Lake State Park 2000: 5), and also with the estimated age for much of the rock art imagery located upon Kachina Bridge (Schaafsma 1978: 69).

Interpreting the Features of a Small Seal Zhōu Pictogram

As a transitional form of writing, the shapes of small seal Chinese script characters preserve many of the features found in earlier pictographic forms of Chinese writing (Chalfant 1906: 4). Nevertheless, during the era of small seal Chinese script, the technologies employed for writing increasingly supported a rapid hand, and the style of these newer characters reflect this developmental progression, as they employ more rounded and abbreviated line stroke patterns. For example, the small seal character for a boat, Zhōu, clearly demonstrates the use of an abbreviated style of writing, while preserving the most important pictorial features of its older oracle-bone and greater seal script predecessors (Figure 30).

The small seal era Zhōu pictogram depicts the structure of a small boat or canoe (Figure 31) with several identifiable nautical features. Connected to the top of the symbol's right sideline (the forward portion of the boat) there is a curved line which is frequently

interpreted as a wavy line of water, or possibly as a "bow painter" rope, or an anchor line. Enclosed within the character's vertical sidelines are several transverse lines, representing the bow of the boat, a midship thwart (cross brace), and the stern of the vessel (Figure 32), respectively.

Figure 30
Chinese small seal Zhōu pictogram

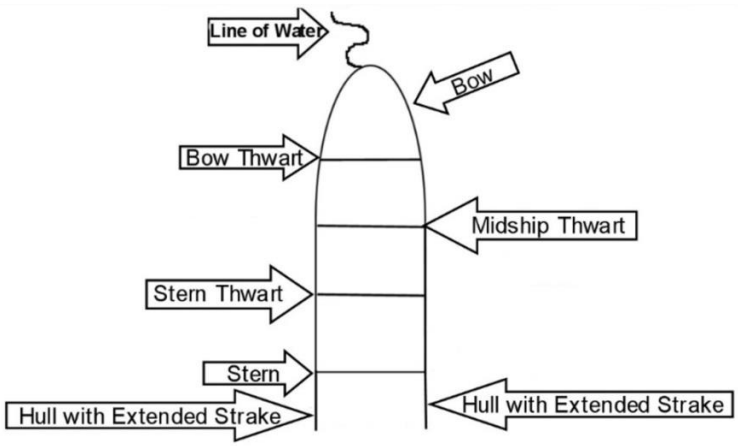


Figure 31
Diagram of a small boat or canoe

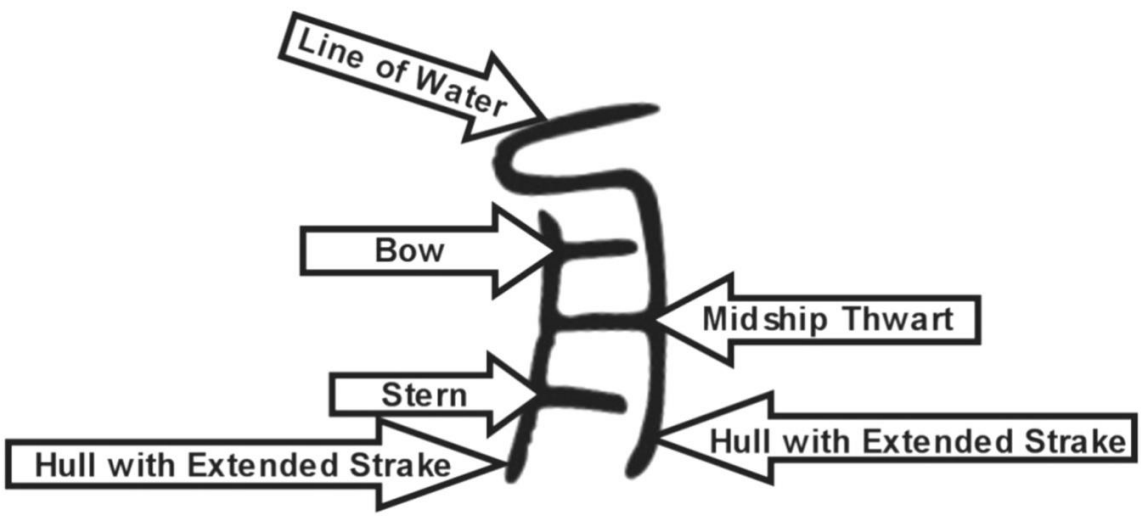
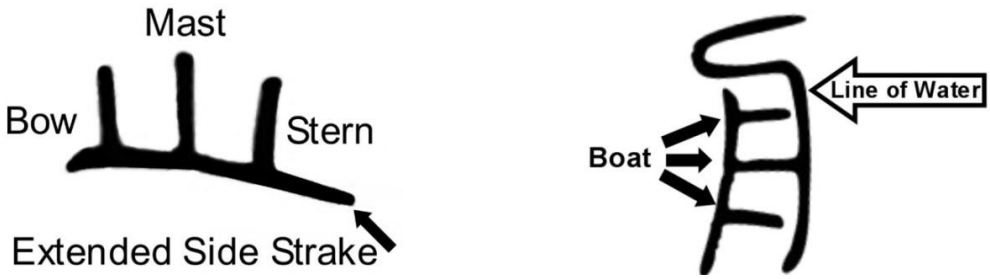


Figure 32
Explanation for the meaning of the
line strokes of a small seal Zhōu

However, an alternative explanation for the features of the small seal Zhōu glyph suggests that the left portion of the character depicts a boat, rotated 90 degrees into a vertical orientation (Figure 33). For this interpretation, the entire extended right side of the drawing represents the water upon which the boat travels, albeit, extending above the vessel.



Diagrammatic profile of the Zhōu boat Rotated 90° with attached water line

Figure 33
Alternative explanation for the features of a small seal era Zhōu pictogram

The Zhōu Pictogram on Little Lake

Below a small cave embellished by a red painted boat pictograph (Figure 10), in Pictograph Cove at Little Lake, California, there is a pecked small seal style Zhōu petroglyph (Figure 34). The features of this image are substantially similar to those of the small seal style Chinese pictogram, Zhōu, described above ($J = 0.7059$; $P < 0.01$). As such, this petroglyph is one of the best examples of a pre-Columbian Zhōu pictogram in North America; and its placement upon a boulder on the shore of Little Lake is most appropriate in this otherwise desert setting. While some of the glyphs around Little Lake have been dated to 6000 BC, most are estimated to be 1500 years old.

Plain photograph Photo with trace lines

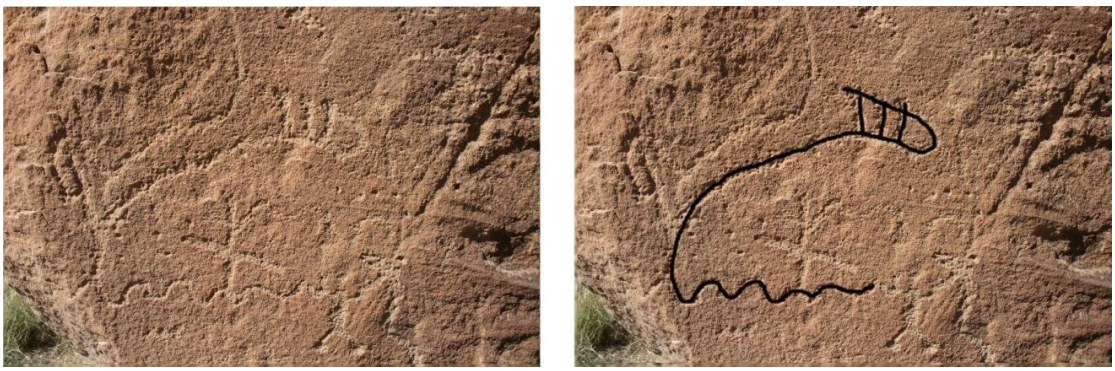
Figure 34
Zhōu petroglyph at Little Lake, California
Appendix A, Chart 7

A Zhōu Pictogram on the Little Colorado River

Pecked into a large boulder located south of Lyman Lake State Park, along the Little Colorado River in eastern Arizona, resides a most remarkable petroglyph (Figure 35). With a rounded top, three thwart lines, and extended sidelines this glyph is recognizable as a depiction of the seal era Chinese radical, Zhōu (Appendix A, Chart 8).

Uniquely, one of the sidelines of this glyph extends beyond the bottom of the image and then morphs into a wavy water line, reminiscent of one form of an oracle-bone Zhōu pictogram (Figure 22E). Extending outward, this water line winds about until it terminates in the hand of an anthropomorphic figure. In its other hand, this person holds a snake-like depiction. Clearly, these glyphs illustrate a story.

Collectively, the features of this Arizona glyph are substantially similar to those of a small seal Chinese Zhōu pictogram ($J = 0.7059$; $P < 0.01$). Considering the estimated age for the glyphs at this site, from 1300 to 1700 years ago, and the shared substantial similarity of this image with a small seal script Zhōu character, this Little Colorado River petroglyph is identified as another example of North American, pre-Columbian, Chinese script.



Plain photograph Figure 35 Photo with trace lines
Zhōu petroglyph at Little Colorado River, Arizona
Appendix A, Chart 8

A Canadian Zhōu Pictogram

Carved upon a large, flat, and crystalline metamorphic boulder at Petroglyphs Provincial Park in Ontario, Canada, are the faint lines of a previously unrecognized Zhōu petroglyph (Figure 36). Fortunately, unlike most of the other images at this location, this overlooked character escaped the paint of well meaning, but misinformed caretakers. Significantly, this glyph contains between its sidelines the image of a stickman; and emanating from the top of its right sideline, there is a long wavy meander line. When the features of a small seal Zhōu pictogram and this glyph are compared (Appendix A, Chart 9), using Jaccard's Index of Similarity, these two characters generate highly significant values ($J = 0.7059$; $P < 0.01$), exceeding the study requirement for classifying them as substantially similar.

Estimates for the age of the images on this rock outcropping range from 600 to 1100 years before present.

Plain photograph

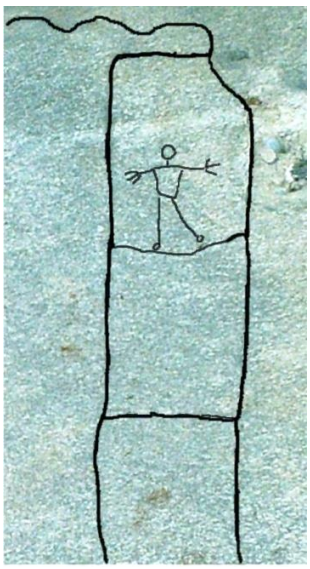


Photo with trace lines

Figure 36
Zhōu petroglyph at Petroglyphs Provincial Park, Ontario, Canada
Appendix A, Chart 9

A Zhōu Pictogram on Anasazi Ridge

On the western side of Anasazi Ridge, near St. George, Utah, there is a glyph which certainly tells a story (Figure 37). In the middle section of this petroglyph, there is a cluster of five diagonal lines, similar to those frequently used by native artists to depict clouds (Patterson 1992: 60). In the section immediately below, there is the image of a person. The exterior outline and interior subdivisions of this image are characteristic of many small seal era Zhōu pictograms (Appendix A, Chart 10). When the line stroke features of this petroglyph are compared with those of a small seal era Zhōu pictogram, the values generated by Jaccard's Index inform us that this glyph is very probably derived from early Chinese writing ($J = 0.5714$; $P = 0.05$).

Importantly, the numerous petroglyphs on Anasazi Ridge have been extensively studied and are estimated to have been created between AD 400 and AD 1000. Notably, this was a time of considerable technological advancement for the indigenous people of the American Southwest. During this innovative era, Native Americans, beginning with west coast tribes and quickly spreading to the east, adopted numerous revolutionary items, such as the bow and arrow. Curiously, it was during this time that the travel of Huì Shēn to the far eastern land of Fú Sāng was entered into the Chinese legal record.

With the basic form of a Chinese Zhōu pictogram, augmented by interior Native features, this Anasazi Ridge petroglyph represents a bilingual style of writing from a historically

transitional period. Most importantly, by placing an anthropomorphic figure within this character, the author provides a significant visual clue for its proper interpretation. Clearly, this glyph represents something that can hold a person, in this case, a boat.

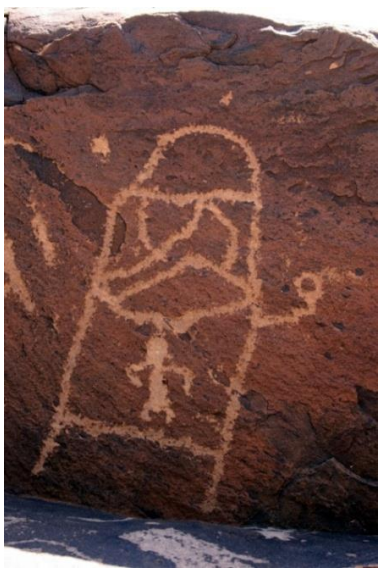
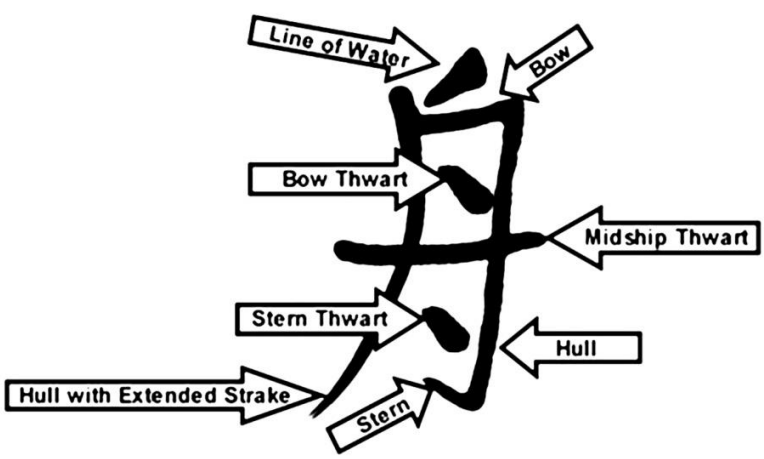


Figure 37
Zhōu petroglyph at Anasazi Ridge, Utah
Appendix A, Chart 10

Clerical script Zhōu Pictograms and Glyphs

In addition to the oracle-bone and small seal Zhōu pictogram identified above, several North American Zhōu images have been identified which were written in the more recent Lìshū (clerical) style of script (see Appendix A, Chart 11). Importantly, clerical script was introduced around AD 220, and by AD 750, it had become the preferred style of Chinese writing. With only slight modifications, it is still recognizable today (Figure 38) as "standard script" (Xigui 2000: 113).

Clerical Script Zhōu
Image: Frank Chalfant



The Nautical Features of a Clerical Script Zhōu

Figure 38

The Clerical Style Zhōu Pictogram in Nine Mile Canyon

One of the more convincing clerical style Zhōu pictograms in North America is located in Nine Mile Canyon, Utah (Figure 39). Here one highly embellished glyph stands out, not only for the quality of the author's script, but especially because it is bisected by an extended transverse line. Above this line are five line strokes, the same as have been identified elsewhere in Native rock art as clouds. Below its long horizontal line is the unmistakable portrait of a person wearing a very curious wide-brimmed hat.

A dot is attached to the top of this Nine Mile Canyon glyph similar to the dash that is placed over a clerical style Zhōu pictogram. Overall, this visually complex Nine Mile Canyon glyph and a clerical style Zhōu character share thirteen line stroke features (Appendix A, Chart 11). Analysis of the level of repatination found on this particular glyph indicates that it is one of the older images at this location, in an area where the numerous surrounding glyphs are estimated to have been created between AD 750 and AD 1250.

Importantly, between the extended strake side lines of this glyph, there are three lines of water. These water lines are identical to those used for writing the Chinese Shuǐ (water) pictogram (see below). The purposeful placement of three water lines within this image confirms its identity as a boat, one with the capability of navigating a large body of water. Based upon the statistical comparison of the features of this Nine Mile Canyon glyph with a clerical script Zhōu pictogram ($J = 0.6190$; $P = 0.01$), it is classified as an example of North American Chinese picture writing.

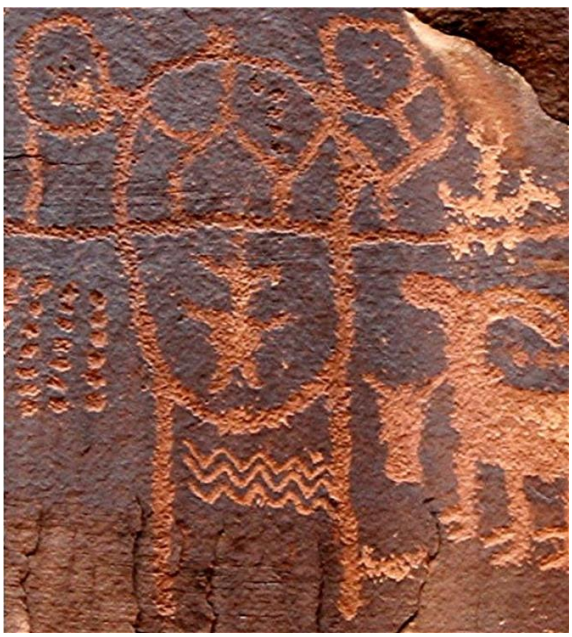
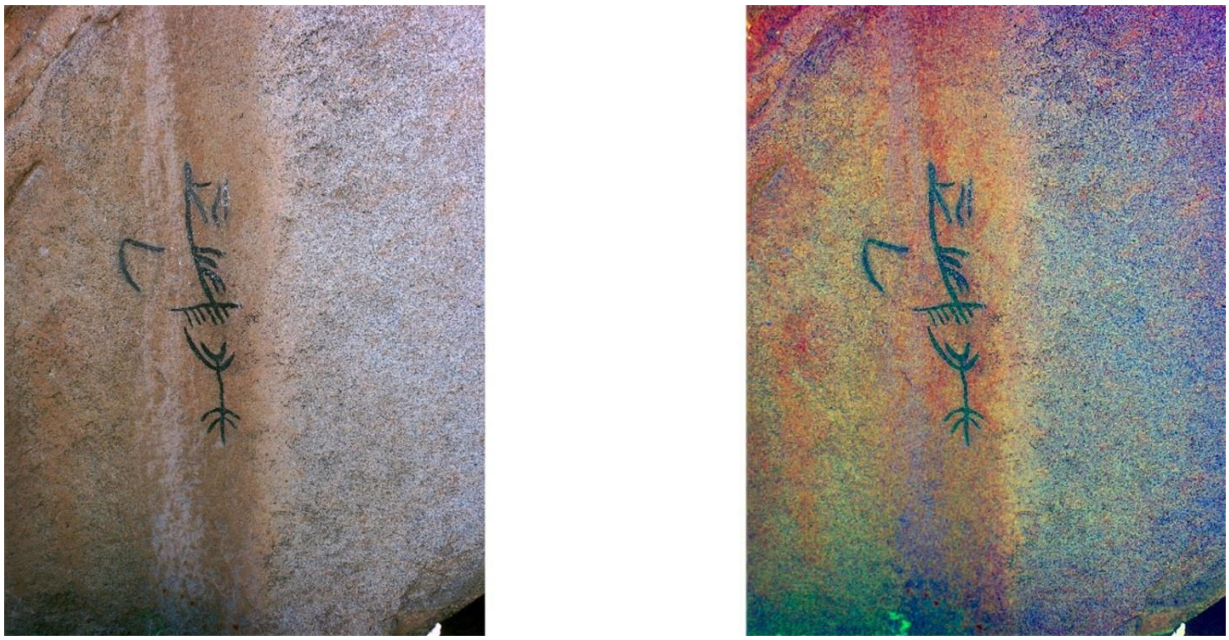


Figure 39
Clerical script Zhōu petroglyph in Nine Mile Canyon, Utah
Appendix A, Chart 11

The Shuĭ (water) Pictogram at Anza Borrego

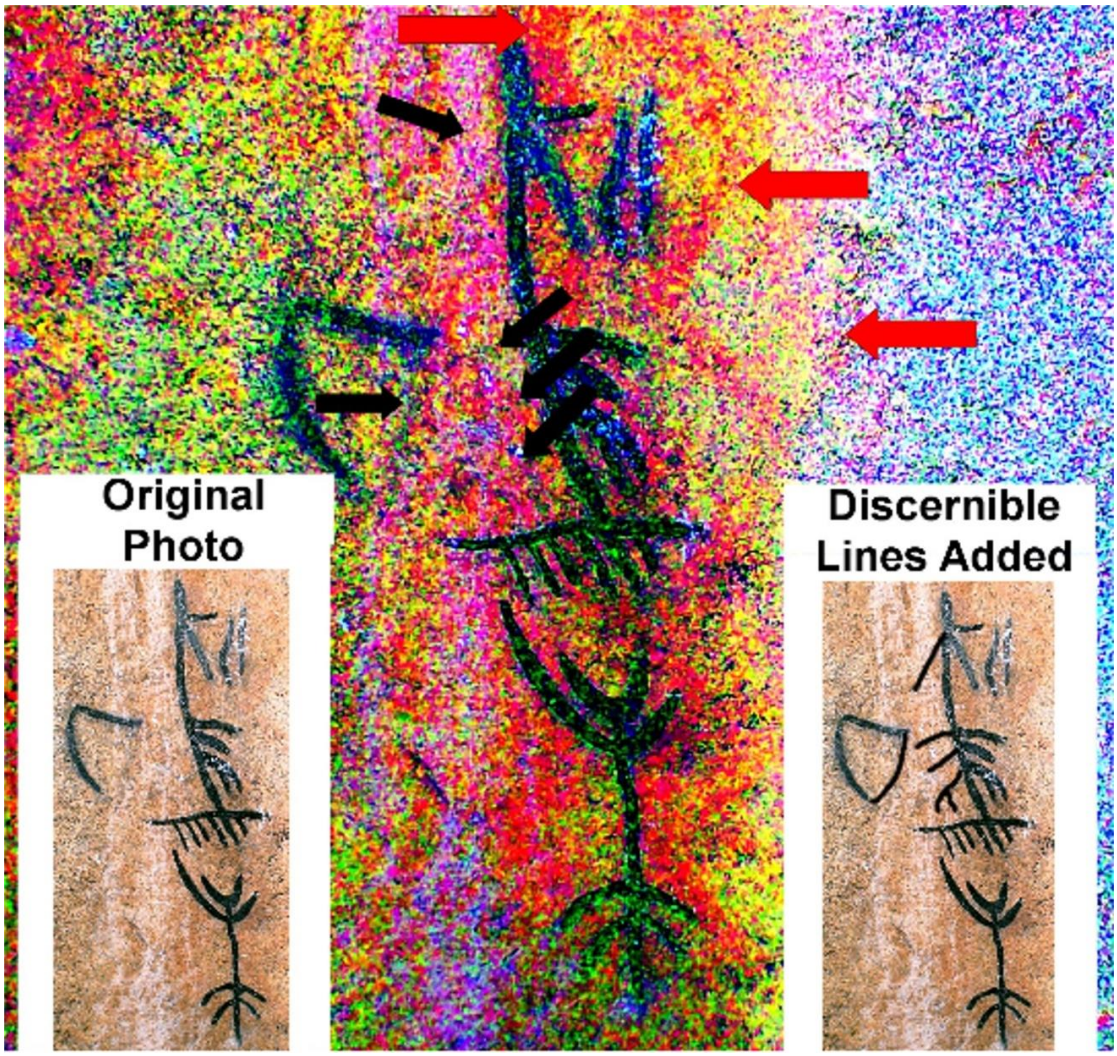
Seventy-five miles northeast of San Diego, in the Anza Borrego State Park, the Mortero trail winds its way through the desert terrain. Here on a large boulder is a set of defaced pictographs, partially painted over by a park ranger in a restoration activity (Figure 40). Beneath the modern paint, three faint red zigzag lines are slightly visible with the naked eye. However, when an image of these pictographs is electronically enhanced by a computer program such as DStretch, the features of these red lines become much easier to see (Figures 40 and 41).



Natural appearance Figure 40 Enhanced image

Shuĭ pictograph at Anza Borrego State Park, California
Appendix A, Chart 12

Fully reconstructed, the two partially repainted glyphs on this rock are identifiable as botanical figures, complete with line strokes for multiple branches and roots. The higher image is embellished by rake-like "root extensions," an illustration often used by Native rock art artists to depict rain or water (Patterson 1992: 165). Such an explanation for this cluster of short, parallel, and downward directed lines supports the interpretation of the three red zigzag lines drawn beneath it (Appendix A. Chart 12) as the Chinese pictogram for water, Shuĭ (Figure 42).



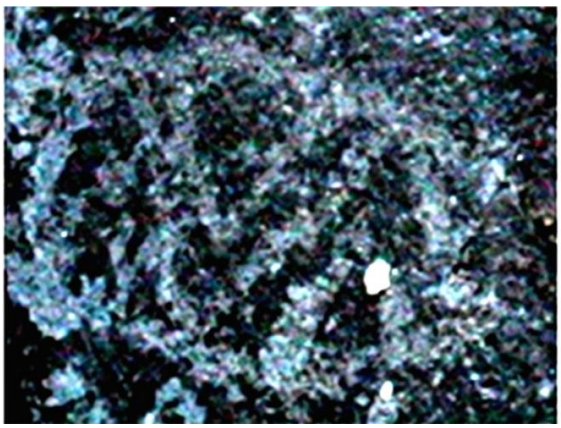
Enhanced Figure 41
Enhanced photograph of the Anza Borrego Shuĭ pictograph
Note: The red arrows point to faint red zigzag lines made visible by image enhancement.
The black arrows indicate additional elements of the original drawing not repainted.

A statistical comparison (Appendix A, Chart 12) of the Chinese pictogram for water, Shuĭ, with the features of the underlying red pictograph's line strokes, with their sharp angular connections and parallel zigzag lines, confirms that these images are identical ($J = 1.000$; $P < 0.001$). Dates for the Native drawings at Anza Borrego range from AD 1 to AD 1500, however most are estimated to be a thousand years old.

Figure 42
Shuĭ pictogram
Image: Frank Chalfant

The Yuān (pond) Pictogram at Little Lake

Pecked into the dark patina of a basalt boulder at the edge of Little Lake, California is an old oval petroglyph cartouche encompassing three parallel zigzag lines (Figure 43), independently estimated to be considerably more than 1500 years old. These three zigzag lines are identical with those of the ancient Chinese pictogram for water, Shuǐ (Figure 42). Viewed together, the line strokes of this petroglyph duplicate those of the ancient Chinese pictogram (Figure 44) for a pond of water, Yuān ($J = 1.0000$; $P < 0.001$).



Plain photograph

Photo with trace lines

Figure 43
Yuān petroglyph at Little Lake, California
Appendix A, Chart 13

In addition, and of great importance for properly reading and interpreting this Yuān-like character, resting upon it and connected to it by a single wavy line, is the Zhōu (boat) petroglyph evaluated above and shown in Figure 34. The supplemental contextual information supplied by the purposeful linking of these two aquatic symbols upon the shore of Little Lake, confirms the identity of each, for here we find two nautical Chinese script characters informing us about a boat floating upon a small lake (Figure 100).

Figure 44
Yuān pictogram
Image: Frank Chalfant

Plants and Trees

The Chinese Mù Pictogram

The pictographic nature of early Chinese writing is very evident in the form of the radical, Mù. From its earliest depiction on oracle-bones (about 1300 BC), the Mù character has remained a bi-laterally symmetrical figure, constructed about a central vertical line, which represents the trunk of a tree. Attached above the middle of this centerline, and extending in both directions, is a set of upwardly directed straight lines (more recent pictograms have curved lines) which represent the tree's branches. In some cases, multiple branch lines were added by ancient authors to the basic Mù character to convey the notion of a larger and more mature tree (see Wèi pictogram, Figure 54). Overall, the Mù pictogram conveys to the reader the concept of a tree, wood, or when found in conjunction with symbols for other objects… something made from wood.

Importantly, the earliest oracle-bone Mù pictograms depict the tree's roots with straight diagonal down and up lines. These lines emanate from the same locus on the lower portion of the image's centerline, one sloping down to the left and the other to the right, each forming approximately a forty-five degree angle with the tree's trunk (Figure 45).

By the time small seal Chinese script came into widespread use around 200 BC, the shape of the roots on the Mù pictogram had morphed into curved lines (Figure 46). This well documented change in the appearance of the Chinese Mù pictogram provides valuable information for dating the script, and for estimating the age of North American Mù petroglyphs.

Figure 45
Oracle-bone Mù
Appendix A, Chart 14
Photo: National Museum of China

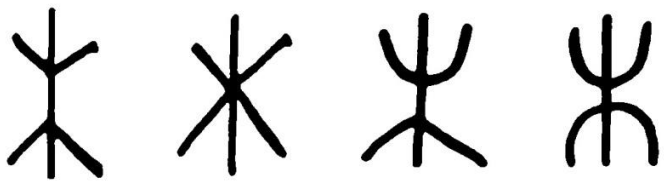


Figure 46
Evolution of the Chinese Mù pictogram
Images: Frank Chalfant

In art, trees may be depicted singly, or when the artist desires to convey the idea of a forest, as multiple images. This concept is also found in Chinese script. While a single Mù pictogram conveys the idea of a lone tree, or something made of wood, placing multiple Mù images together conveys to the reader the concept of a forest (Figure 47).

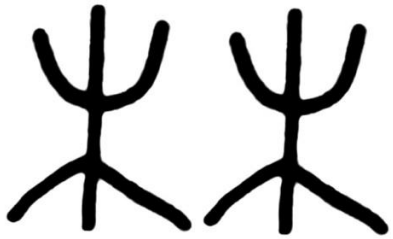


Figure 47
Adjoining Mù pictograms; meaning "forest"

Two Styles of the Mù Pictogram at Red Canyon

At the Red Canyon petroglyph site, north of Bishop, California, numerous, frequently superimposed, glyphs are scattered along the long escarpment of a small ridge just east of Mt. Whitney. Interspersed among this conglomerate of rock art are examples of the Chinese tree pictogram, Mù, written in both oracle-bone and seal era script styles.

One of the more heavily repatinated glyphs at this location (Figure 48) clearly depicts an oracle-bone era Mù character, with its straight diagonal up and down root lines ($J = 0.8889$; $P = 0.001$).

Figure 48
Straight rooted Mù petroglyph at Red Canyon, California
Appendix A, Chart 15

A second Mù pictogram (Figure 49) is located nearby. Different from the oracle-bone symbol shown above, this character was created with two gently upward curving branch lines and two equally curved downward sloping root lines. It is substantially similar to Chalfant's sketch of a seal era Mù pictogram ($J = 0.8889$; $P = 0.001$). Not without significance, most of the glyphs at this site are estimated to be about one thousand years old, yet some are considerably older (Whitley 1996: 72).

Figure 49
Curved branch and root Mù petroglyph at Red Canyon, California
Appendix A, Chart 16

An Orchard Hand

On a rock art panel near the Chetro Ketl pueblo ruins in Chaco Canyon, New Mexico, are a number of Ancestral Puebloan petroglyphs (Figure 50). Dated to a time between AD 850 and AD 1250, one of these Chinese script-like characters depicts a human hand, Shǒu (Figure 51). Two other images have botanical shapes characterized by bilateral symmetry around a vertical centerline topped with boxlike figures, representing a plant with fruit or flowers (see Guǒ pictogram, Figure 56). By placing the Chinese script character for a human hand between the symbols of fruit trees on this singular panel of rock writing, this ancient author preserves for us a message about harvesting fruit.

At the far-right side of this rock writing panel is the Chinese script symbol for a tree, Mù. Unlike many of the other Chinese pictograms discussed in this report, the basic form of the Mù pictogram has changed very little over time. The identification of this glyph as a Chinese script Mù (tree) symbol is supported by the substantial similarity it shares ($J = 1.0000$; $P < 0.001$) with a bronze era example of Chinese calligraphy (Appendix A, Chart 17).

Curiously, peach trees are native to China and once were very prevalent in this region of the American southwest. In fact, in 1864 when Kit Carson invaded the Native villages at nearby Canyon de Chelly (located about 120 miles directly west of Chaco Canyon) he

destroyed over 5000 peach trees (Grant 1979: 122). Clearly, growing orchards in this part of the world was a longstanding agricultural practice.

Figure 50
Mù petroglyph (far right) in Chaco Canyon
Appendix A, Chart 17

Set in the middle of this panel of ancient rock writing, the Chinese pictogram Shǒu, meaning "hand," conveys to the observer the notion that this panel of deeply incised imagery is informing us of a farming activity, harvesting fruit. When compared to a bronze era script Shǒu character (Appendix A, Chart 36) this petroglyph yields a value for the Jaccard's Index of $J = 0.7647$, along with an associated probability for its independent creation of $P = 0.001$.

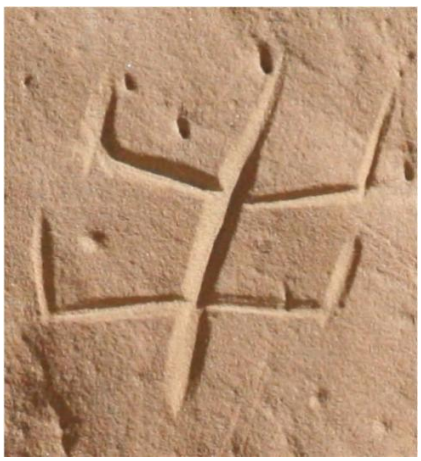


Figure 51
The Chaco Canyon Shǒu (hand) petroglyph
Appendix A, Chart 36

The Wèi Pictogram at Painted Rocks

As an embellished form of the basic Mù pictogram, the Chinese character Wèi takes the form of a larger and more mature tree. With the same fundamental shape as Mù, the Wèi character is augmented by a second set of upwardly curved branches (Figure 52). Like the Mù pictogram, the form of the Chinese Wèi character has changed very little during the past 3800 years.

Modern ----------Intermediate ages----------Oracle-bone

Figure 52
Historical styles of the Wèi pictogram
Image: Frank Chalfant

At Painted Rocks State Park, near Gila Bend, Arizona, there is an ancient petroglyph (Figure 53) composed of line strokes that are identical with those used for writing an older style of the Chinese Wèi pictogram (Figure 54). When the features of these two symbols are compared (Appendix A, Chart 18) the following points of similarity are evident. First, both characters are bi-laterally symmetrical about a central vertical line. Second, from the top portion of the centerline each image has four upwardly directed curved lines, two emanating from each side of the figure. Third, each of these two characters has a pair of sharply angled 45-degree downward sloping straight lines, attached to the lower portion of the centerline.

In all, thirteen identical features are shared by this Painted Rocks petroglyph and a bronze era Wèi pictogram. They have the same line strokes, the same inter-stroke touch relationships, and possess the same spacial line stroke features. By application of Jaccard's Index of Similarity, these two images demonstrate perfect similarity ($J = 1.000$), and the probability that they were created independently by chance is less than one in a thousand ($P < 0.001$). Based upon its visual appeal, confirmed by the values generated by application of Jaccard's Index, this Painted Rocks pictogram is deemed to be substantially similar to an older form of the Chinese character, Wèi. Consequently, this Painted Rocks State Park figure is interpreted as an illustration of a bronze era Chinese Wèi pictogram.

Importantly, this Painted Rocks petroglyph is a clean depiction with no extraneous lines, nearby detractors, or graffiti. While the oldest images at this location were created around AD 350, the most recent glyphs are dated to as late as AD 1400. However, most of the imagery at Painted Rocks is estimated to be about 1100 years old, displaying the same level of repatination as is found on this Wèi pictogram.

Figure 53
Wèi petroglyph at Painted Rocks State Park
Appendix A, Chart 18

Figure 54
Ancient Chinese Wèi pictogram
Image: Richard Sears

Two Guǒ (fruit tree) Pictograms

Only a few hundred feet from the Lyman Lake Zhōu pictogram described above, resides another old petroglyph (Figure 55). Like the Chinese radical for a tree, Mù, this glyph is composed of a vertical centerline, an upwardly curved left branch, and a pair of roots, formed by two opposed downward sloping forty-five degree straight lines (Appendix A, Chart 19). In addition, this petroglyph is embellished by the placement of a circular figure atop its centerline that slopes to the right.

Figure 55
Lyman Lake petroglyph

+

Figure 56
Guǒ pictogram
Appendix A, Chart 19
Image: Richard Sears

=

Figure 57
Overlaid images

Overall, this Lyman Lake symbol shares eleven points of congruency with a textbook depiction of an oracle-bone Chinese pictogram for a fruit tree, Guǒ (Figure 56). The similarity of the line strokes ($J = 0.7273$; P 0.01) composing these two images is evident when the individual figures are superimposed (Figure 57). Consequently, this Lyman lake petroglyph is identified as the Chinese script character for a fruit tree, Guǒ.

Another petroglyph, located on Atlatl Rock in the Valley of Fire State Park, near Las Vegas, Nevada (Figure 58), has also been identified as substantially similar (J = 0.8462; P = 0.001) with an image of a seal era Guǒ pictogram (Appendix A, Chart 20). Like the Guǒ pictogram above Lyman Lake, this petroglyph has the form of an embellished Mù pictogram, with a circular feature added atop its centerline. It is estimated that this Atlatl Rock petroglyph was created sometime between 300 BC and AD 1500; and based upon its line stroke characteristics, is identified as an ancient Guǒ Chinese script symbol.

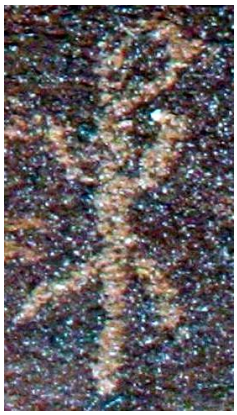


Figure 58
Atlatl Rock Guǒ petroglyph at Valley of Fire State Park
Appendix A, Chart 20

An Oklahoma Cì (thorn) Pictogram

In the western panhandle of Oklahoma, not far from the Colorado border, one of the most visually striking and clearly Chinese glyphs in North America (Figure 59) has been identified. Carved into the soft sandstone at this location is the depiction of the ancient Chinese pictogram for a thorn, Cì (Appendix A, Chart 21). With the shape of an ornamented plus sign (+), the pointed ends of this image reveal its true character. Descending from the lower portion of the image's central vertical line are singular diagonal up and diagonal down line strokes. These lines are identical with those of the oracle-bone era Chinese radical for a tree, Mù, and in the same manner, communicate to a reader that this character is to be interpreted as something botanical.

In addition, both ends of the glyph's single horizontal line are embellished by V-shaped figures, the same as are depicted on a Cì pictogram (Figure 60). The sharpness of these line strokes conveys the notion of barbs or thorns. This Oklahoma glyph is visually and statistically substantially similar with a drawing of an oracle-bone Chinese Cì character (J = 1.0000; P < 0.001), and the complexity of its design, clearly reveals its Chinese ancestry. Correspondingly, in western Oklahoma there was a tradition of creating petroglyphs of this general style, called "pecked abstract," between the years of 2700 BC and AD 850.

Figure 59
Cì petroglyph near Kenton, Oklahoma
Appendix A, Chart 21
Photo: Donald Heidt

Figure 60
Chinese Cì pictogram
Image: Frank Chalfant

The Tián (field) Pictogram in New Mexico

At Piedras Marcadas Canyon in Albuquerque, New Mexico, there is a relatively simple image formed by the placement of a plus sign (+) within a rectangular outline (Figure 61). The features of this glyph are comparable with the Chinese character for an agricultural field, Tián (J = 0.9091; P < 0.001). Importantly, the identification of this symbol as a Chinese pictogram (Appendix A, Chart 22) is supported by its purposeful placement alongside three other identifiable Chinese pictograms (Figure 101). Additionally, the level of repatination on this petroglyph matches that on other nearby Native images, which the National Park Service estimates were created from as early as AD 500 to as recently as AD 1680, although some are considerably more ancient.

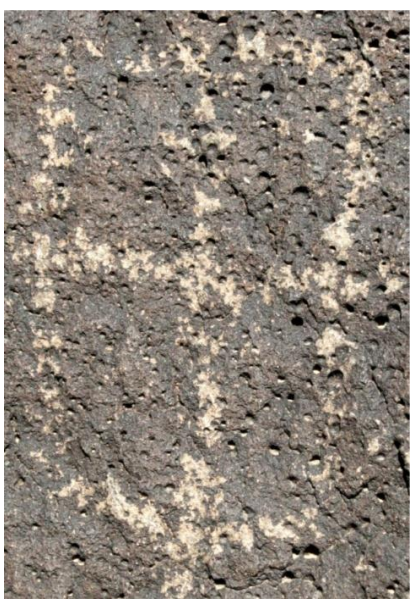


Figure 61
Tián petroglyph at Piedras Marcadas Canyon
Appendix A, Chart 22

Additional Characters

Teeth in Grapevine Canyon

Pecked into a boulder at the eastern end of Grapevine Canyon, Nevada, there is an ancient petroglyph composed of two sets of equally spaced rectangles, strategically placed in opposition with each other, within a square border (Figure 62). This image is identical with the ancient Chinese oracle-bone era pictogram for teeth, Chǐ (Figure 63).

Figure 62
The Grapevine Canyon Chǐ petroglyph

Figure 63
Oracle-bone Chǐ pictogram
Image: Adapted from Richard Sears

A comparison of the line stroke characteristics of these two images (Appendix A, Chart 26), by application of the Jaccard Index of Similarity, confirms that they are substantially similar ($J = 0.9211$; $P < 0.001$).

Significantly, two other petroglyphs on the same panel of rock art provide important clues useful for determining the origin of this Grapevine Canyon Chǐ pictogram. The line strokes of one of these images match those employed in the ancient oracle-bone era Chinese script symbol for a field, Tián (Figure 64), and the other petroglyph is substantially similar to the oracle-bone script symbol for a pool of water, Yuān, (Figure 65). Notably, all three of these written symbols exhibit the same level of repatination, indicating that they are approximately equally old. Statistically, the chance of independently drawing these petroglyphs, each with a set of line strokes congruent with a unique oracle-bone era Chinese script symbol, is less than one in a billion.

Figure 64
Tián petroglyph

Figure 65
Yuān petroglyph

A Directional Thorn

Located near St. Johns, Arizona, is an old petroglyph (Figure 66) drawn with the same complex pattern of line strokes (Appendix A, Chart 27) as those employed for writing the ancient seal era Chinese script symbol for a thorn, Cì (Figure 67).

Pecked into the flat top surface of a small boulder the stem line of this "thorny" St. Johns glyph indicates north and south. Significantly, the side-branches of this symbol form an east-west line, pointing to the exact location where the sun rises on the bi-annual equinoxes. This is the same east-west alignment exhibited by the branch lines on the substantially similar Cì petroglyph located almost 500 miles away near Kenton, Oklahoma (Figure 59).

Figure 66
St. Johns Cì petroglyph

Figure 67
A seal era Cì pictogram
Image: Frank Chalfant

It is highly likely that different individuals with knowledge of ancient Chinese script drew these two, complex, widely separated, and substantially similar North American images. Significantly, all nineteen of the Arizona petroglyph's line strokes and inter-stroke touch relationships match those of a seal era Chinese script Cì figure (Appendix A, Chart 27). This is the same number of matching line stroke characteristics identified in the analysis of the Oklahoma Cì petroglyph, although it was written in a slightly different and older style of Chinese script (Appendix A, Chart 21).

The statistical probability that both of these pre-Columbian Cì images were drawn by chance and formed without knowledge of Chinese writing is less than one in a million. In addition, the fact that the side branches of these two North American Cì petroglyphs demonstrate the same east-west directional orientation indicates that: either Native Americans appropriated this symbol from Asiatic visitors and used it as a directional marker, or that still unidentified ancient Asiatic explorers created these two images for the same fundamental purpose.

A Symbol of Culture

Carved into the flat surface of an outcropping of Sioux quartzite called Red Rock Ridge at the Jeffers Petroglyphs Historic Site in southwestern Minnesota, is a simple petroglyph (Figure 68) with all the characteristics of the ancient Chinese pictogram, Wén (Figure 69). When the line stroke features of this generally overlooked figure are statistically compared with those of an oracle-bone Wén pictogram (Appendix A, Chart 28) the results confirm the congruency of these two images ($J = 1.000$; $P = 0.001$).

Figure 68
Jeffers Petroglyphs Historic Site petroglyph
Photo: National Park Service

Figure 69
Chinese oracle-bone Wén pictogram
Image: Adapted from Richard Sears

Importantly, both this Jeffers Site petroglyph and the Wén pictogram are equally old anthropomorphic illustrations, although in Chinese the Wén symbol may also be associated with such ideographic concepts as "culture" and "literature." Numerous highly similar illustrations (Figure 70) have been identified at rock art sites across North America and around the world, suggesting that the meaning of this simple symbol was widely understood in ancient times. In addition, Native American authors sometimes augmented the basic form of the image with additional line strokes to accentuate its humanity. Examples of such embellishments are the horizontal "skirt-line" on a petroglyph in the Boca Negra Canyon section of the Petroglyph National Monument (Figure 70-A; Appendix A, Chart 29), and the opposable thumb and ground line attached to a petroglyph at Stillwater Cave, Minnesota (Figure 70-D).

A B C D

Figure 70
North American petroglyphs similar to the Chinese pictogram Wén
Drawings: Helen M. Whittier Harvey

Occasionally, in other ancient drawings, Native American artists utilized the four basic line strokes of the Wén figure to create more elaborate illustrations, some of which are today interpreted as birds, or, more specifically, as "thunderbirds" (Figure 71).

Figure 71
Petroglyph National Monument thunderbird

Other Native images of the Chinese Wén symbol enhance the basic anthropomorphic character of the figure by embellishing it with hands or feet (Figure 72). Such emblematic personifications impart action to the figure, ideographically suggesting work, knowledge, or motion (Houston 2008: 167).

Figure 72
A Wén figure embellished with large hands, Coal Canyon, Utah
Appendix A, Chart 44

A Very Strange Looking Dog

High above the public trail in the Rinconada Canyon section of Albuquerque's Petroglyph National Monument, a large boulder with dark patina is embellished with an old, complex, and abstract petroglyph (Figure 73). This unique image was constructed using many of the same line strokes (Appendix A, Chart 30) as are found in the seal era Chinese written symbol for a dog, Quǎn (Figure 74).

Figure 73
Rinconada Canyon Quǎn petroglyph

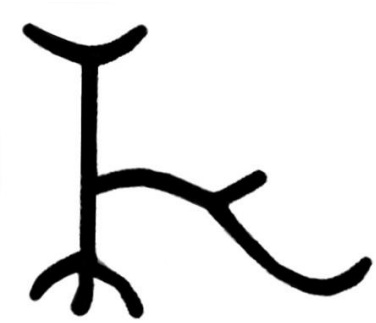


Figure 74
A seal era Quǎn pictogram
Image: Frank Chalfant

The most recognizable feature of the Quǎn pictogram is the long vertical line depicting the anterior portion of the animal. The top end of this line forms a junction with an upwardly curving arc, representing the dog's face and ears; while the lower terminus of this line stroke connects with a trifid set of diminutive toes. A singular relatively short line, representing a tail, emanates at approximately a right angle from the middle of the curved body of this line-art dog. In addition to the above features, this Rinconada Canyon petroglyph has two supplemental line strokes attached to the lower side of the figure, similar to those found in earlier versions of the Quǎn pictogram (Figure 75).

Bronze era

Oracle-bone era

Figure 75
Earlier examples of the Quǎn pictogram
Images: Richard Sears

A comparison of the line strokes of this Rinconada Canyon petroglyph with those of a seal era Chinese Quǎn pictogram, by application of the formula for the Jaccard Index of Similarity, reveals that these two images are substantially similar ($J = 0.6667$; $P = 0.01$).

Beautiful Flower

Along the same Rinconada Canyon trail where the Quǎn pictogram described above is located, there is another equally old and complex illustration, which combines elements from two separate Chinese pictograms into a single image. This striking figure accurately depicts the seal era Chinese script symbol for a beautiful flower, Huā (Figure 76).

Figure 76
Rinconada Canyon Huā petroglyph

Central to this petroglyph is its vertical stem line, which at the top, like that of the Chinese Huā pictogram, curves to the right. Equally spaced on both sides of the glyph's stem line are two sets of downward curving arcs, depicting the blossoms of a very beautiful flower. At the focal point of each of these four arcs, there is a dot, representing the central disc of each bloom. It is important to note that while the basic seal era Huā pictogram was drawn with only one arc (flower) on each side of the stem line, Chinese calligraphers stylistically embellished this elementary symbol with a second set of arcs (Figure 77) to convey the concept of a flower with exceptional beauty (Chalfant 1906: Plate VIII). Demonstrably, the ancient author of this Rinconada Canyon pictogram was aware of this epigraphic variation for the Huā pictogram.

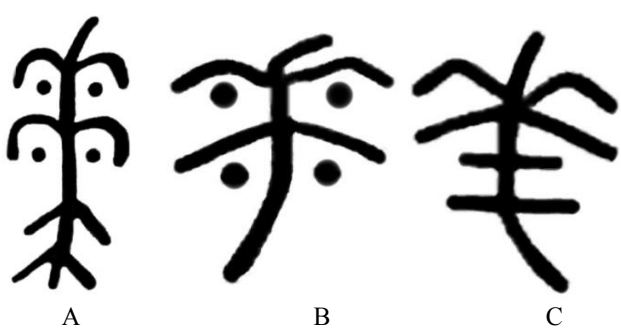


Figure 77
Alternative forms of the seal era Huā pictogram
Images: Frank Chalfant

Rather than embellishing the bottom of the flower's stem with downward sloping "root lines," typically found on botanic illustrations from this era of Chinese calligraphy, the author of this Rinconada Canyon image uniquely connected the lower portion of the flower's stem to the seal era Chinese symbol for earth or ground, Tǔ (±), in a manner similar to the style of the Huā pictogram shown in Figure 77-C. Importantly, the incorporation of the above two modifications into a single Chinese script pictogram reveals that the author of this New Mexico Huā petroglyph possessed considerable knowledge about the nuances of ancient Chinese writing.

In spite of periodic imperial decrees aimed at standardizing the style of script used in ancient China, the history of Asiatic writing is replete with unauthorized modifications of its script symbols. In fact, the frequent use of novel pictograms in ancient Chinese writing created such a significant problem that even Confucius, with all his understanding, frequently had trouble deciphering earlier writings. The noted Chinese historian Endymion Wilkinson informs us that “the different scripts did not follow one after the other in orderly fashion, each growing from the previous one in a linear progression. They evolved over several centuries and often overlapped” (Wilkinson 2000: 409).

Consequently, the use of modified forms of Chinese script in the North American rock writing record, such as those employed in the petroglyph depicting a beautiful flower in Rinconada Canyon, may be anticipated. Nevertheless, when the line strokes of this particular image are compared with those of the seal era Huā pictogram shown in Figure 77-A, by application of the Jaccard Index of Similarity, the generated statistical values (Appendix A, Chart 31) confirm the substantial similarity of these two figures ($J = 0.7778$; $P < 0.001$).

Boat & Water

Pecked into the dark patina of Newspaper Rock in the Petrified Forest National Park, Arizona, are two connected and equally repatinated petroglyphs (Figure 78). One of these glyphs depicts a small seal era Chinese Zhōu (boat) pictogram (Figure 78-A; red trace lines), and the other is an illustration of the Chinese pictogram for water, Shuǐ (Figure 78B; green trace lines).


Figure 78

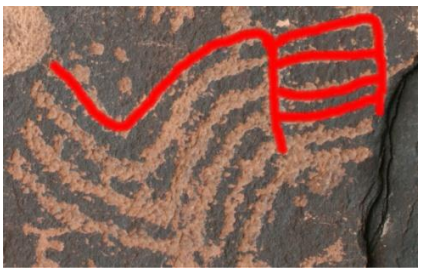


Figure 78-A


Figure 78-B

The connected Zhōu and Shuǐ petroglyphs on Newspaper Rock

When the line strokes of the boat petroglyph emphasized in Figure 78-A are compared, using the formula for the Jaccard Index of Similarity, with those of a Bronze era Chinese Zhōu pictogram (Appendix A, Chart 32) the calculated statistical values confirm the substantial similarity of these two images ($J = 0.8235$; $P < 0.001$). Likewise, when the line strokes of the adjoining wavy lined petroglyph, highlighted in Figure 78-B, are compared with those of a seal era Chinese Shuǐ pictogram by the same process (Appendix A, Chart 33) the substantial similarity of this second pair of symbols is also established ($J = 1.0000$; $P < 0.001$).

The use of so many water lines in one drawing is found in both Asiatic calligraphy and North American rock art. However, the customary practice in both of these writing systems was to vary the number of the representative wavy lines in direct proportion to the intended amount of water. For example, in ancient Chinese writing the concept of a small spring or brook is conveyed to a reader by a single wavy line pictogram, Quǎn (Figure 79). Similarly, a stream, Kuài, is depicted in Chinese script by two parallel wavy lines; and correspondingly, three wavy lines are employed to draw the pictogram for a large river, Chuān. Consequently, it is possible to understand the intended meaning of this Newspaper Rock petroglyph's multiple water lines. Evidently, the author desired to associate the boat symbol connected to these wavy lines with an exceptionally great quantity of water.

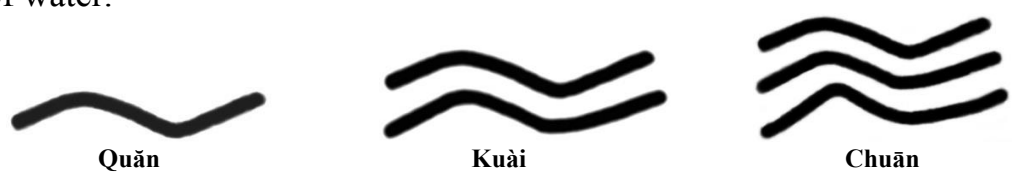


Figure 79

Aquatic Chinese pictograms for a brook (Quǎn), a stream (Kuài), and a river (Chuān)

Images: Frank Chalfant

A Thread of Oriental Influence

Located on the same panel of rock art as the Zhōu and Shuǐ pictograms discussed above, a third significant petroglyph also displays Asiatic influence (Figure 80). This symbol was constructed with line strokes substantially similar (Appendix A, Chart 34) to those of the oracle-bone era Chinese pictogram for thread, Mì (Figure 81). The center portion of this figure portrays a string of three rectangles, created by the purposeful crisscrossing of two equally long zigzag lines, which represent the characteristic twisted fibers of thread.

Figure 80
Newspaper Rock petroglyph

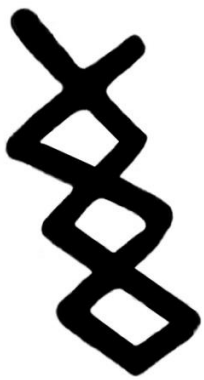


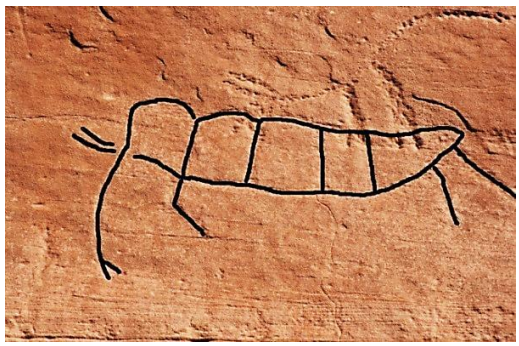
Figure 81
Oracle-bone era Mì pictogram
Image: Richard Sears

By application of the formula for the Jaccard Index of Similarity, the probability for the independent creation of this interwoven petroglyph apart from knowledge of the Chinese pictogram Mì is calculated as one chance in a hundred (P = 0.01). Consequently, in conformance with the study parameters, these two symbols are classified as substantially similar.

A Most Unforgettable Elephant

In 2011, Malotki and Wallace documented that several elephant-like petroglyphs (Figure 82), were carved into a sandstone bluff along the San Juan River near Bluff, Utah. In an article published in *Rock Art Research,* they suggest that these apparently very old drawings could be illustrations of mammoths. Whether these drawings actually document mammoths or another member of the taxonomic order Proboscidea remains uncertain. Nevertheless, with what appear to be long bifurcated trunks, and short upwardly curving dual tusks, these ancient petroglyphs are fascinating prehistoric visual images. And, in spite of the exposed nature of the sandstone bluff they appear upon, Malotki and Wallace estimate that these figures are between 11,000 and 13,000 years old. However, a recent independent and extensive scientific evaluation of these petroglyphs places their age at no greater than 4000 years before present (Bednarik 2013: 7).

Plain photograh



Photograph with trace lines

Figure 82
A San Juan River "mammoth" petroglyph

Significantly, in the Petrified Forest National Park approximately one-hundred fifty miles southwest of the riparian drawings investigated by Malotki and Wallace, there is an even more telling depiction of a member of the Elephantidae family (Figure 83). Although this complex petroglyph appears alongside numerous native drawings of multiple clan symbols, anthropomorphs, and zoomorphic figures in full public view, this previously unrecognized illustration of a quadruped creature is uniquely important in the North American rock writing record.

Figure 83
The Petrified Forest elephant petroglyph
Appendix A, Chart 35

For unlike the realistic drawings researched by Malotki and Wallace, this deeply pecked and markedly repatinated Newspaper Rock depiction has a form substantially similar to that of the ancient Chinese script symbol for an elephant, Xiàng.

The National Park Service estimates that the figures on the rock art panel alongside this Xiàng petroglyph were created between 600 and 2000 years ago. Significantly, this period immediately follows the era in which this style of the Xiàng pictogram was predominant in Chinese writing (900 BC - 221 BC).

Quantitatively comparing the line strokes of this petroglyph with those of a Chinese bronze era script elephant pictogram (Figure 84) confirms the similarity of these two characters (Appendix A, Chart 35). Both of these symbols portray an animal with a trifid tail, an S-shaped bodyline, and multiple line strokes representing hair drawn strategically upon the back of the animal. However, the petroglyph's depiction of the animal's trunk as a long straight line, embellished by two sharply pointed tusks, and the addition of four leg lines to the image, confirming that the character is a quadruped, are features not found on Chinese bronze era Xiàng pictograms.

Nevertheless, this comparison of a North American petroglyph with a Chinese pictogram generates a total of twenty-nine line stroke features and a value for Jaccard's Index of $J = 0.5172$, indicating that with 95% confidence these are substantially similar depictions. However, if the petroglyph's four leg lines and the extreme curve of its trifid tail are not included in the comparative calculation, the value of Jaccard's Index increases to $J = 0.8095$, informing us that the likelihood of these two representations being independently created is less than one in a thousand ($P < 0.001$).

Figure 84
Bronze era script pictogram for an elephant
Image: Frank Chalfant

The presence of this ancient and unique Chinese script elephant pictogram in the Petrified Forest National Park of Northern Arizona irrefutably demonstrates that long before Columbus or any other European explorer visited North America, there was Asiatic

influence in the American Southwest. Moreover, the significance of identifying multiple ancient and complex Chinese pictogram-glyphs in association with this Xiàng pictogram should not be underestimated. The probability for the chance creation upon Newspaper Rock of the four ancient Chinese script figures of Xiàng, Mì, Zhōu, and Shuǐ, separate from a working knowledge of Chinese calligraphy, is less than one out of 20 billion [$P_{Total} = 1 / (P_{Xiàng} = 0.05) \times (P_{Mì} < 0.001) \times (P_{Zhōu} < 0.001) \times (P_{Shuǐ} < 0.001)$].

Consequently, for these four Chinese pictograms to exist together, as we find them today in North America, there are only two plausible explanations. Either a Native American somehow obtained a working knowledge of ancient Chinese script and, subsequently, wrote in pre-Columbian times in what is today the Petrified Forest National Park; or sometime between approximately 900 BC and 200 BC, a literate Asiatic visitor came to this region and created these Chinese symbols.

However, whether a Native individual or an ancient Asiatic explorer pecked this Chinese script elephant into the patina of the Petrified Forest's Newspaper Rock, the Asiatic ancestry of this pictogram suggests that the estimated age for the elephant-like drawings near Bluff, Utah, published by Malotki and Wallace, may need to be reconsidered. Visibly, the presence of a distinctive ancient Chinese script elephant pictogram upon Newspaper Rock demonstrates that the characteristic features of such creatures were known and written about in pre-Columbian North America. Unquestionably, whoever created this now significantly repatinated Xiàng symbol, likely several millennia ago, could also have drawn a picture of an Asian elephant, with a profile akin to that of a Columbian mammoth, on a nearby sandstone bluff in southern Utah. Most certainly, additional research on this topic is warranted.

A Desert Dog and Water

Northwest of Laughlin, Nevada, along Christmas Tree Road, is the highly curious and ancient rock art site called Grapevine Canyon. Upon arrival at the nearby parking lot, and after a short hike to the glyphs, one encounters a plethora of boulders so covered with petroglyphs that there is hardly room for any addition. While many of these images are dated to a time between AD 1200 and AD 1750, a considerable number are much older as the super positioning of newer glyphs upon very ancient ones is quite prevalent. Over time a multiplicity of stylistic forms were utilized by the ancient authors at this site, which once was, and sometimes still is a local source for water. Not surprisingly, here we can find the ancient Chinese symbol for a pool of water, Yuān, composed of three characteristically in-phase wavy horizontal lines within a cartouche outline (Figure 85).

Figure 85
The Grapevine Canyon Yuān (water) petroglyph

Comparing this image with a known oracle-bone Yuān pictogram, by application of Jaccard's Index of Similarity, generates the following values, $J = 1.0000$, and $P < 0.001$ (Appendix A, Chart 38), confirming the similarity of the two images.

Supporting such an interpretation for this highly repatinated and very old Grapevine Canyon Yuān symbol, an equally old Chinese Quǎn (dog) pictogram-glyph is located nearby (Figure 86). With a pair of trifid feet, a tail, and dual ears, this canine image compares very favorably ($J = 0.7143$; $P = 0.001$.) with a Chinese oracle-bone era script symbol for a dog (Appendix A, Chart 37).

Figure 86
The Grapevine Canyon Oracle-bone era Quǎn (dog) petroglyph

A Riparian Flower and Thread

On a cliff facing the Little Colorado River west of Eager, Arizona, and near the 26 Bar ranch formerly owned by actor John Wayne, resides a spectacular faded red pictograph depicting the seal era symbol for a flower, Huā (Figure 87). Characteristically, this script symbol is composed of a central stem surrounded by two or three sets of inverted "V" blossoms. When the line stroke features of this figure are compared with those of a Chinese seal era Huā pictogram (Figure 77C) using the Jaccard Index, the calculated values indicate that the chance probability for the independent creation of this most unusual pictograph, separate from knowledge of Chinese script, is less than one in a hundred (Appendix A, Chart 39).

Figure 87
Little Colorado River Huā (flower) pictograph

Located in this same region of the Little Colorado River, a second recognizable ancient Chinese script pictogram portrays the twisted strands of a thread or rope (Figure 88). Emanating upward from the trifid roots of this botanical symbol are two sharply angled zigzag lines. Together, as they crisscross several times, these lines create a visual pattern of four vertically connected diamonds. When compared with the oracle-bone era Chinese script symbol Mì, meaning "thread," this petroglyph generates a value for Jaccard's Index

of $J = 0.6667$ and is associated with a probability value for the chance similarity of these two symbols of $P < 0.001$ (Appendix A, Chart 40.)

Figure 88
The Little Colorado River Mì petroglyph

The Sign of Friendship

One of the earliest Chinese script symbols, Péng, indicates "friendship." To communicate the notion of fidelity, ancient Chinese calligraphers drew two facing birds in profile, joined together at the breast (Figure 89). At several locations in the American Southwest, and particularly near Albuquerque, New Mexico, similar depictions are not hard to find. One particularly beautiful rendition of this symbol is located in the Boca Negra region of the Petroglyph National Monument (Figure 90).

Figure 89
Péng, the ancient Chinese symbol for friendship
Image: Adapted from Qiu Xigui

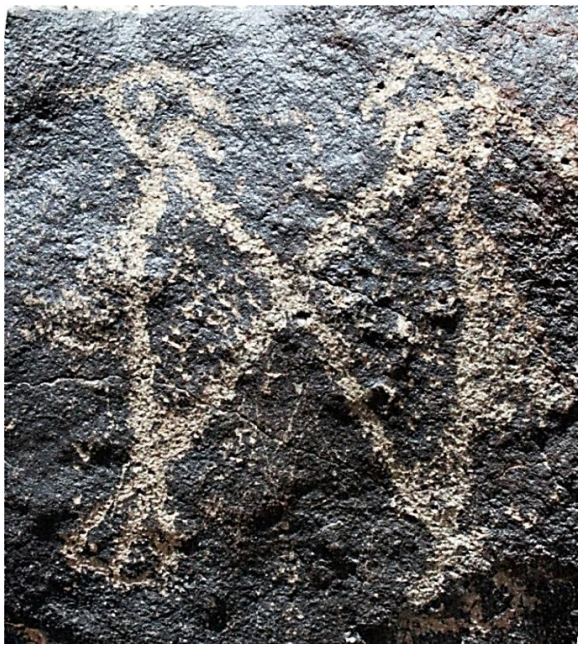


Figure 90
Boca Negra birds of friendship

When the line strokes of this Boca Negra petroglyph are compared with those of the pre-oracle-bone era Chinese "friendship" symbol (Péng) by application of Jaccard's Index, the similarity of these two illustrations is confirmed by a value of $J = 0.6786$; and the corresponding value of $P < 0.001$ (Appendix A, Chart 41).

Several additional images of facing birds have been identified in disparate regions of the Petroglyph National Monument (Figures 91 & 92). Variations of this representational symbol have been found near Santa Fe, New Mexico, at the La Cieneguilla petroglyph site (Figure 93).

Figure 91
Appendix A, Chart 42

Figure 92
Appendix A, Chart 43

Facing birds in the Petroglyph National Monument

Figure 93
La Cieneguilla facing birds

However, the most demonstrable confirmation that images of facing birds were intended to be read in ancient North American rock writing in the same manner as they are found in equally old Chinese script is found in the inverted pairing of bird profiles within the Petroglyph National Monument. In such depictions, one bird appears upside down relative to the other (Figure 94). Such an inversion of a pictogram in Asiatic and North American early writing informs the reader of a condition of negation, an example being the common use of an inverted stickman for communicating the idea of death in both cultures (Figures 115 and 116). With the inversion of one of the birds in this Rinconada Canyon pairing, we can clearly understand that this symbol informs us about something less than a lasting friendship.

Figure 94
Inverted bird profiles

Five Sacrifices

Deep in the heart of Piedras Marcadas Canyon, pecked into a small boulder at the foot of a mesa with an unobstructed view of the city of Albuquerque, are three clustered and equally weathered petroglyphs (Figure 95). These three images have forms substantially similar to the bronze era pictograms of Niú (ox), Kŏu (mouth), and Wŭ (the number five).

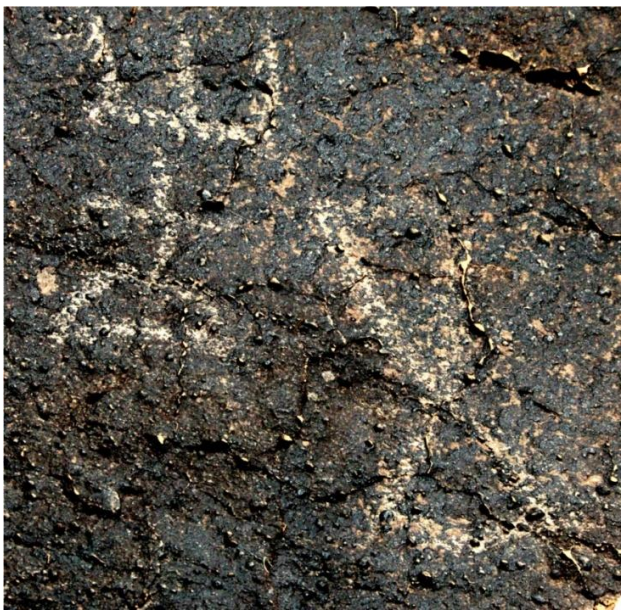


Figure 95
Bronze era Niú (top left), Kŏu (bottom left), and Wŭ (right) petroglyphs

To correctly understand the meaning of these three clustered ancient Chinese script symbols it is important to note that the oldest style of Gào was bipartite, composed of the script Niú drawn above the symbol of Kŏu. And the purposeful placement of this ancient form of Gào immediately alongside of the equally old symbol of Wŭ at this location suggests that they are to be viewed together. Reading these figures collectively from right to left as Chinese writing, the paired ancient symbols of Wŭ and Gào inform us of "five sacrifices."

Comparing the line strokes of this complex Gào (sacrifice) petroglyph with those of a corresponding ancient Chinese pictogram yields a value for Jaccard's Index of $J = 0.8125$, and the associated probability for its independent creation ($P < 0.001$) of less than one in a thousand (Appendix A, Chart 48). A similar comparative analysis for the adjoining Wŭ petroglyph generates a value of $J = 1.0000$, and the probability for its chance creation is also less than one in a thousand (Appendix A, Chart 49).

However, caution is advised for any interpretation of these incredibly old and highly repatinated glyphs. Native Americans also employed a symbol identical to Wŭ, composed of two opposing triangles to convey the concept of conflict or war (Martineau 2003: 101). Consequently, if these symbols are an example of bilingual rock writing, the

symbol of Gào being of Chinese origin and Wŭ being Native American, they still preserve the memory of a long-forgotten violent event that likely occurred at this site. Nonetheless, whether the accompanying hourglass image is of Chinese or Native origin this is a historic site containing numerous Native American petroglyphs which was embellished by a literate Chinese person long ago… someone who wrote in pre-Columbian times using bronze era Chinese script pictograms.

A Chinese Emblem in Rinconada Canyon

Between 3400 BC and 2250 BC the Liángzhŭ people lived in the Yangtze River Delta region of east central China. They were an advanced population for their time, blessed with agricultural bounty and riches, one of which was jade. As a sign of wealth and power, jade was used to create numerous items, among which were large bi-lateral ritual discs. Some of these jade "bi discs" were incised with a unique mark, either that of the artisan who made it or, alternatively, its owner (Figure 96).

While the emblems or marks engraved upon bi discs are not considered to be formal writing, their use at ancient sites such as Liángzhŭ suggest that they were early precursors of Chinese script. In addition to their placement upon ritual jade pieces, these emblems are also found on axes, pots, and various other items from the period. Evidently, they were employed for the purpose of identification, much as we use trademarks and signatures today.

As one walks along the sandy Rinconada Canyon trail of the Petroglyph National Monument in Albuquerque, New Mexico, just before arriving at one of the most sacred Native sites[1] in the park, the detailed depictions of numerous ancient artisans are plainly visible. Here, high above the path and facing the eastern sunrise, one very old and faded petroglyph stands apart from all the others. This significantly repatinated and scratched depiction of a bird standing upon a tiered geometric platform (Figure 97) is reminiscent of ancient Chinese sun-bird motifs, such as the image of a bird-on-a-pedestal that was carved into a Liángzhŭ jade bi disc over 4000 years ago.

When this petroglyph was new, it was clearly visible to all who passed by. And, as the image on a Liángzhŭ jade bi disc informs us about its manufacture or ownership, this ancient petroglyph still functions in a like manner, notifying us of a long-forgotten identity.

1. Michael Medrano, Acting Superintendent of the Petroglyph National Monument (personal conversation, April 17, 2013).

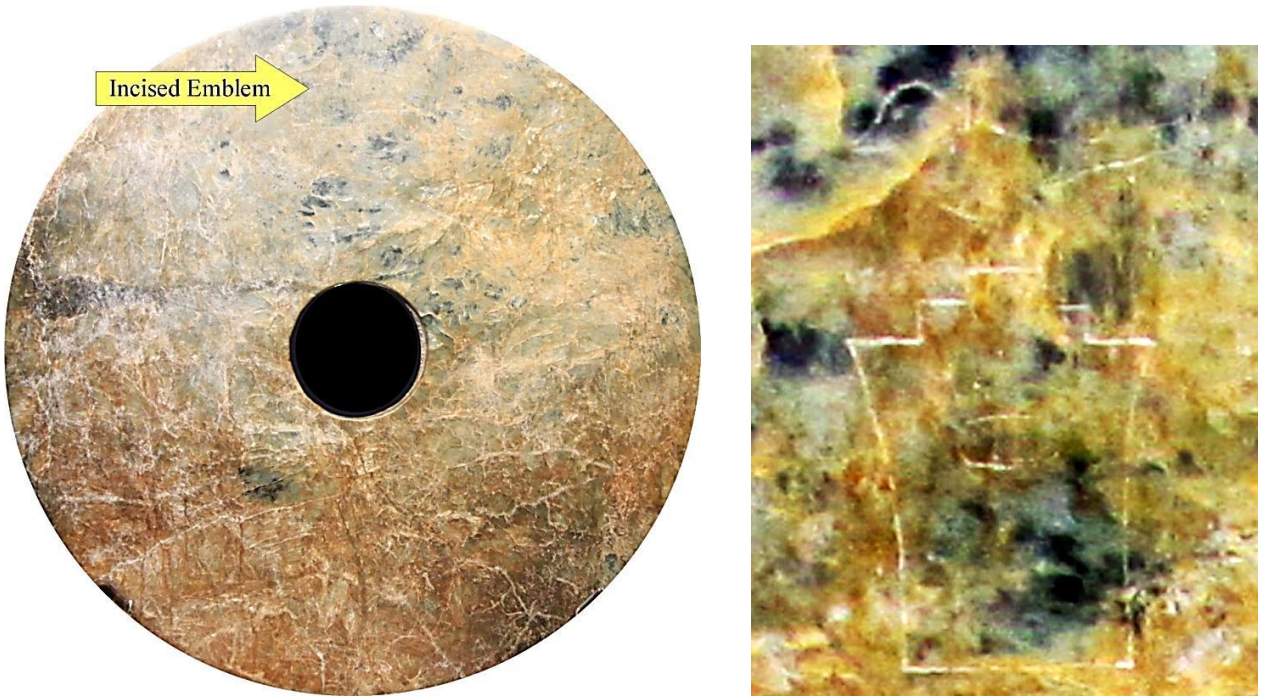


Figure 96
Liángzhǔ jade bi disc with an enlargement of the bird-on-a-pedestal emblem.
Image: Shanghai Museum

Comparative statistical analysis (Appendix A, Chart 52) of the line strokes comprising this Rinconada glyph with those drawn upon the Liángzhǔ bi disc verifies the similarity of the images ($J = 0.6129$; $P < 0.01$). Consequently, as several additional early Chinese pictograms have been identified near this site in Rinconada Canyon, it is highly unlikely that this Southwestern bird-on-a-pedestal petroglyph was created independent from Asiatic influence.

Figure 97
The Rinconada Canyon petroglyph of a bird standing upon a pedestal

A Most Definitive Offering

Located halfway up a volcanic mesa in Rinconada Canyon, in an area sacred to today's Native American population, there is a highly complex and very important Chinese pictogram-glyph. Demonstrably, this script image is of the ancient Chinese bronze era pictogram Xiàn, meaning, "to offer" (Figure 98). Specifically, this symbolically multifaceted figure is composed of three ancient Chinese script depictions: a dog (left), the head of a tiger (top), and a sacrificial cauldron (bottom). Unmistakably, the pictographic complexity of this image leaves little doubt about its heritage. Most assuredly, this is an authentic and readable (confirmed by the noted sinologist David N. Keightley) example of ancient Asiatic writing in pre-Columbian North America.

Figure 98
The complex Chinese Rinconada Canyon petroglyph, Xiàn;
dog (upper left) and the head of a tiger upon a cauldron (right)
Appendix A, Chart 50

Statistically comparing the major features of this petroglyph with those of a Chinese bronze era Xiàn pictogram clearly reveals that the likelihood for the chance creation of this compound image apart from an Asiatic counterpart is equal to one in a thousand.

Groupings of Chinese Pictograms in North American Rock Writing

A Boat and a Large Tree

Without outside influence, the probability that North American native people would have invented multiple complex images substantially similar to Chinese pictograms is essentially nil. Therefore, the identification of several readable sets of Chinese script characters, at multiple locations spread across hundreds of miles of North American real estate would be highly significant. Fortunately, several examples of such rock writing have been identified.

In the Valley of Fire State Park, north of Las Vegas, Nevada, a highly weathered panel of petroglyphs (Figure 99) preserves the side-by-side symbols of oracle-bone era Chinese Zhōu (Appendix A, Chart 23; $J = 0.8182$; $P < 0.01$) and Wèi (Appendix A, Chart 24; $J = 0.7143$; $P = 0.001$) pictograms. Of note, the repatination covering the wavy water line of this Zhōu symbol is clearly significantly older than many of the other images at this location, most of which are dated from AD 500 to AD 700.

Figure 99
The Valley of Fire Zhōu (left) and Wèi (right) petroglyphs
Appendix A, Charts 23 and 24

For the interpretation of Native North American rock art there is no standard order in which symbols are to be read, other than by recognizing the intentional grouping of individual characters (Martineau 2003: 42). Accordingly, the reading order for assemblages of rock writing glyphs must frequently be deduced from the contextual setting of the characters.

One of the most informative features of Native American rock writing, other than the symbol itself, is the directional orientation (facing) of the rock panel upon which the ancient author placed his message. South is a favored Native American direction, the home of the Sun Father and considerable positive celestial activity. East and West directions were somewhat less favored. North facing rock surfaces, the direction of cold and death, are generally devoid of Native depictions.

In *The Ancestral Landscape,* Keightley informs us that the ancient Chinese also organized their world to the four cardinal directions around a central core (Keightley 2000:83). Similar to the conventions employed by Native Americans for the placement of their rock art, the Chinese pictograms identified in North American rock writing also reflect sensitivity to directionality. Curiously, both the ancient Chinese and Native Americans associated north with the dead; set their buildings along north-south lines, frequently with openings to the east; and although there was local variation, each group assigned the colors of blue, white, yellow, red, and black to the four cardinal directions and a geographical middle (Davis 2001: xxx).

Many North American Chinese rock writings face towards the West, the direction of China. However, others do not; and without the benefit of additional visual clues, such as the crack and boundary lines employed for deciphering ancient oracle-bone scripts (Keightley 1978: 71), the reading order for ancient Chinese rock writing is much less certain. While some horizontal patterns of North American Chinese rock writing read from left to right, others read from right to left. Nevertheless, vertical combinations read only from top to bottom.

Therefore, it is only with some conjecture that the two horizontally aligned symbols found at this Valley of Fire location may be read. Their side-by-side arrangement informs us that these two ancient Chinese pictograms depict either a boat transporting wood hewn from a very large tree or, if read in the opposite direction, the construction of a boat from the wood of a mature tree.

Alternatively, if either the Wèi or Zhōu pictogram was intended to be a semantic determinative, meaning, respectively, "large" or "something that floats," then these two glyphs may be read together with the singular meaning of a "large boat," or, in the opposite direction, as "driftwood."

A Boat on a Pond

Discussed separately on the previous pages, a second set of readable ancient Chinese pictograms (Figure 100) has been identified at Little Lake, California. Here the Chinese seal era characters for a small lake, Yuān (Appendix A, Chart 13), and for a boat, Zhōu (Appendix A, Chart 7), are physically connected together. The level of repatination found on these two glyphs is the same as is on most of the other images at this unique site, which are estimated to be at least 1500 years old.

The setting in which these glyphs reside, on the shore of the small, spring-fed Little Lake, supports the reading of these two coupled Chinese pictograms as a single nautical story. In addition, as these two ancient Chinese script symbols were written linked together long ago, they cannot be interpreted as a spurious combination of unrelated depictions. Rather, as equally old, readable Chinese scripts, they record the ancient activity of a boat upon a lake, most likely Little Lake. Importantly, this desert oasis has been inhabited for at least 8000 years (Maturango Museum 2007:4) and is an important waypoint for travelers, being an area rich with wildlife and migrating birds.

Figure 100
The Little Lake Chinese seal era Zhōu petroglyph upon
and connected to the Chinese Yuān petroglyph below it
Appendix A, Charts 7 and 13

A Nautical and Agricultural Story

In the Piedras Marcadas Canyon region of The Petroglyph National Monument at Albuquerque, New Mexico, one set of petroglyphs stands out especially from all others (Figure 101). Here, in a line from right to left across the face of a single boulder, are separate Chinese pictograms for a boat, Zhōu (Appendix A, Chart 3), a fruit tree, Guǒ (Appendix A, Chart 25), a field, Tián, (Appendix A, Chart 22), and plants, Chè (Appendix A, Chart 54). Grouped as they are upon this one rock, these four highly significant Chinese characters reside amongst numerous examples of what are demonstrably Native rock art images (Figure 102). As each of these glyphs is substantially similar to an ancient Chinese script character, they are uniquely incongruous in this otherwise Native setting.

Figure 101
Right to left: Petroglyphs of Zhōu, Guǒ, Tián, and Chè at Piedras Marcadas Canyon
Appendix A, Charts 3, 25, 22, and 54

Figure 102
Images of the Native glyphs surrounding the Chinese petroglyphs at Piedras Marcadas Canyon

Curiously, the Zhōu pictogram pecked onto this rock is attached to a very long and periodic wavy line, which meanders across an adjoining side of the boulder (Figure 103). The exceptional length of this water line indicates that this boat traveled upon a long river or a great amount of water (Chalfant 1906: Plate XIX). When read from right to left, the preferred direction for reading Chinese (Taylor et al. 1995: 102), these four identifiable Chinese characters pictographically depict how after a long voyage in a boat, a fruit tree was associated with an agricultural field. Many of the glyphs at this location date from AD 500 to AD 1680, but some are considerably older.

Figure 103
Long wavy line connected to the Piedras Marcadas Canyon Zhōu petroglyph

Recording an Ancient Chinese Offering

On the western edge of Albuquerque, New Mexico, in the Petroglyph National Monument's Rinconada Canyon, there is a medium sized boulder (Figure 104) upon which are inscribed several complex ancient Chinese script characters. Here we find the following symbols: Xiàn, meaning "to offer" (Chart 50); Quǎn, meaning "dog" (Chart 30); Dà meaning king; Jié, a man kneeling before the king holding up his seal for admittance (Chart 75); Gēng, the seventh of the ten Celestial Stems of Chinese script and a name given posthumously to the 5th king of the Shang dynasty (Chart 51); and Dà Jiǎ, the name of the 3rd king of the Shang dynasty (Chart 47) .

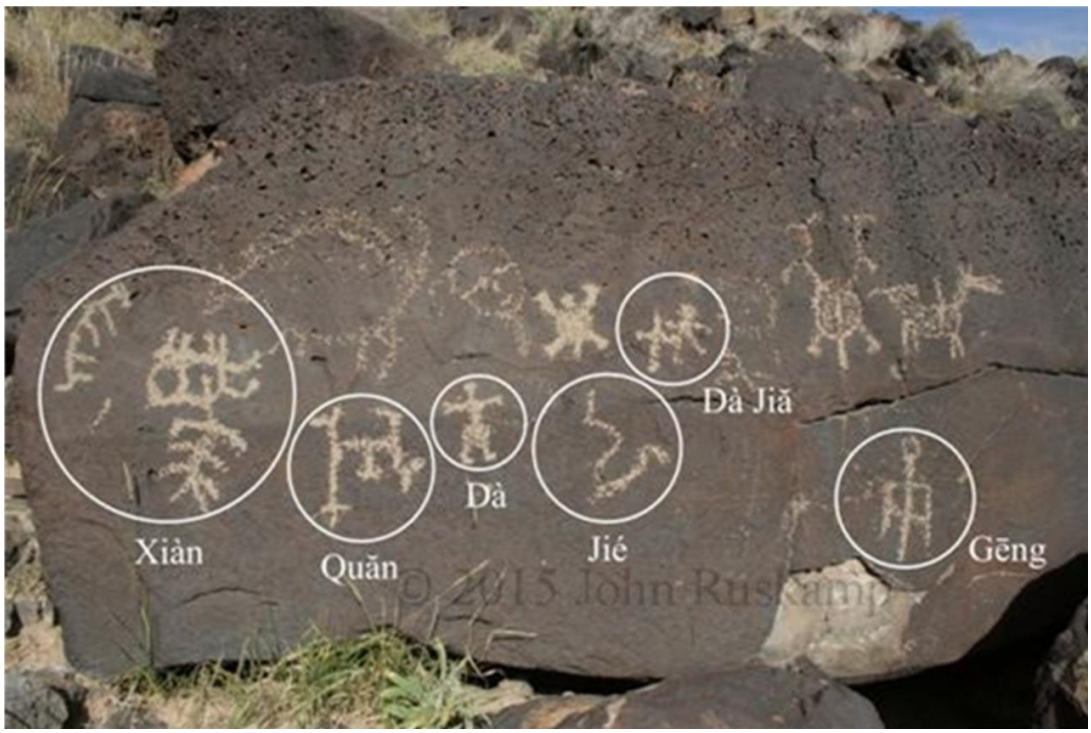


Figure 104
The Rinconada Canyon boulder

As mentioned before, when analyzing North American rock art, one must consider the direction a work faces, as very often directionality is part of the overall meaning. Important for our understanding of these ancient Chinese symbols, they face the west. Together, these symbols record a sacrificial offering, probably that of a dog (a delicacy to some), performed in honor of, and directed to the west towards the home of the Shang dynasty king, Dà Jiǎ (Figure 105). (Note: See *Supplemental Report* #1 for a complete translation of this ancient Chinese message.)

Figure 105
The Rinconada Canyon Gēng petroglyph (left) and an oracle-bone era Chinese Gēng pictogram (right)
Appendix A, Chart 51

Independently, David N. Keightley has confirmed that these petroglyphs are readable as ancient Chinese characters. In fact, Keightley was the first to note the two symbols for the name Dà Jiǎ (Figure 106) upon this boulder, and communicated this insight with the following message: "John… You might perhaps, see the term Dà Jiǎ, A Shang ancestor!"

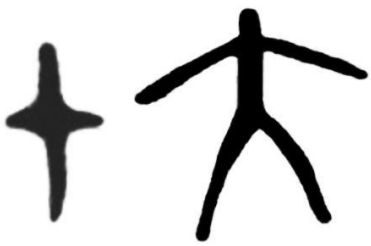


Figure 106
The petroglyph of Shang king Dà Jiǎ (left) and oracle-bone script symbols for his name (right)
Appendix A, Chart 47

Estimating an age for these incongruous pictogram-glyphs is no easy task. Significantly, they all exhibit repatination so they cannot be judged to be of recent manufacture. Insightfully, Keightley informs us in "*Sources of Shang History"* that an emerging Shang practice was to add the preface Dà (meaning "great") to the kings' names, such as Dà Jiǎ, Dà Gēng, or Dà Wù (Keightley 1978: 207d). Following the end of the Shang dynasty this custom was gradually supplanted by a different form of appellation, although it took until approximately 200 BC before this newer manner of naming Chinese kings became fully adopted. Consequently, the careful placement of the name Jiǎ upon this boulder, in direct contact with the ancient Chinese "stickman" character Dà, suggests that these petroglyphs date to a time between ca. 1200 BC and 200 BC.

Notably, the ancient Chinese seal script (221 BC - 206 AD) character for a dog, Quǎn, closely matches one of this boulder's petroglyphs, while a bronze era script (1122 BC - 221 BC) Xiàn pictogram matches with another. In addition to the Dà Jiǎ petroglyph described above, such comingling of Chinese script styles suggests that the

author of this message lived during a time of generally unregulated Chinese calligraphy, that is sometime before the standardization of Chinese writing began in earnest around 221 BC. Consequently, allowing for the evolutionary entrance of newer styles of script into Chinese writing, the multiple ancient Chinese characters displayed upon this New Mexican boulder exemplify patterns of writing generally associated with the period from 1000 BC to 200 BC.

Of importance for our proper understanding of this ancient panel of rock writing, it is located in what has always been a sacred site for Native Americans. Today, Native people continue to gather at this location just as their ancestors did to perform traditional religious ceremonies. As in ancient times this is not a place where anyone can freely decorate the rocks however they may choose. Rather, such site desecration is now, and likely always was a forbidden activity. From Native tradition and understanding, we know that in ancient times pecking into the rocks at a revered site was a very special privilege, reserved only for recording messages of overwhelming cultural importance.

An Auspicious Message

In the same area of the Petroglyph National Monument where the boulder containing the early Chinese symbols of Xiàn, Quǎn, Gēng, and Dà Jiǎ is located, there is another large rock bedecked with two additional ancient Chinese oracle-bone characters (Figure 107). The first of these symbols, Xún (Figure 108), represents the ten-day Chinese weekly period (Appendix A: Chart 53). The second figure is a more deeply pecked representation of the pictogram, Jí (Figure 109), meaning "auspicious" (Appendix A, Chart 46).

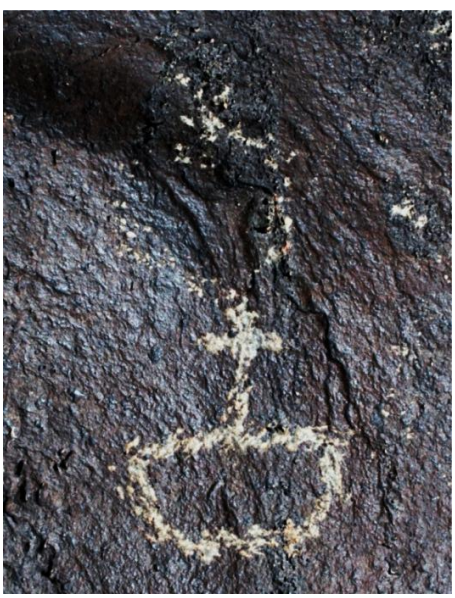


Figure 107
The pictogram-glyph prognostication in Rinconada Canyon

Figure 108
A Xún pictogram
Image: Adapted from Richard Sears

Figure 109
The Jí pictogram
Image: Frank Chalfant

As mentioned earlier, the form of the characters used in oracle-bone script were not standardized. Calligraphers of that era frequently modified the symbols to reflect their own personal style, thereby making reading all the more difficult. Consequently, to be confident that any modern interpretation of oracle-bone script is correct, the context in which a symbol appears needs to be considered.

Importantly, the two oracle-bone symbols pecked into the dark patina of this Rinconada Canyon boulder are physically connected and appear in the same order as do similarly inscribed characters found upon oracle-bones in China (Figure 110). Characteristically, in such divinations the symbol Xún precedes the character Jí, as it is part of a divination's leading inquiry about the favorability of the upcoming ten-day period. The Jí symbol then follows, providing the answer… it will be "auspicious!"

← The King
← Reading the oracle-bone cracks
← Divines
← The upcoming 10-day period (Xún)
← Will not be
← Disastrous.
← The King
← Reading the cracks (on the oracle-bone)
← States verbally that this is
← Auspicious. (Note: Use of an alternative form of Jí)

Figure 110
Translation of an actual oracle-bone divination
Script images: David N. Keightley

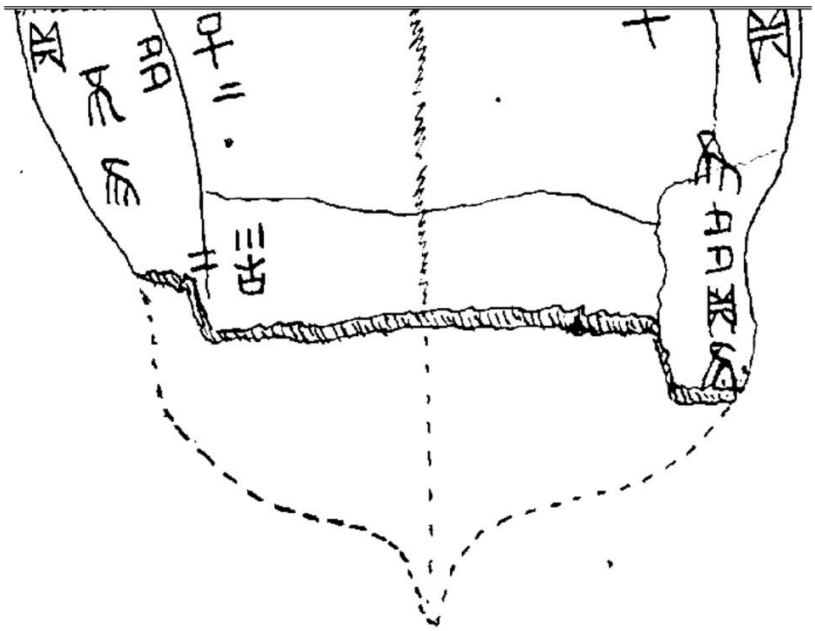


Figure 111
Sketch of an oracle-bone showing the pictogram Jí (古) inscribed at lower left.
Image: Frank Chalfant

When read together, these two very old Rinconada Canyon petroglyphs preserve the record of an ancient traditional Chinese oracle-bone era divination occurring in pre-Columbian North America. Demonstrably the author of these symbols had an understanding of the most ancient style of Chinese writing and the syntax employed for recording sacred divinations for the upcoming ten-day period. Consequently, as knowledge of this form of Chinese writing was lost to humankind shortly after 1150 BC, until it was rediscovered at Anyang, China in AD 1899, the etymology of these two readable oracle-bone pictogram-glyphs can only reside in Asia.

Conclusions

The origin of North American rock writing is a highly controversial and politically charged topic. While ancient stone glyphs evoke curiosity in most observers, by their very nature they are extraordinarily difficult to categorize and quantify, or date with certainty by any established scientific methodology.[2] Some knowledgeable rock art researchers have put forth plausible explanations for particular symbols, but most prudent investigators avoid assigning meaning or ownership to the various glyph characters, largely due to their uncertainty and the sometimes-wild speculations which have been and, unfortunately, still are found in some rock art research reports.

As Bruce Trigger reminds us… the ultimate goal for the field of archaeology "must be to recover knowledge of what has been forgotten" (Trigger 2006: 531). Demonstrably, and with robust analytic evidence, this study fulfills that quest; for it has recovered overlooked information preserved by ancient Chinese North American rock writing.

Native Americans frequently attribute many rock images to their ancestors; yet, to date little conclusive proof for the authorship of these symbols has been offered. Generally, the greater the age of a depiction, the less we know about it. Consequently, until now the best answer for the origin of many of these enigmatic illustrations has been that they were created by unspecified "ancient ones," or that we simply do not know who the authors were.

In contrast to such historical uncertainty, the comparative evidence presented here, documenting the substantial similarity of Chinese pictograms with North American rock writing, establishes that the trans-Pacific exchange of intellectual property began sometime before knowledge of oracle-bone script perished from human memory over two thousand years ago.

Markedly, oracle-bone script fell into disuse following the end of the Shang dynasty (c. 1040 BC) and lay forgotten in the ground for over two millennia. Only relatively recently, in 1899, were fragments of the script rediscovered in China. Consequently, the line stroke patterns associated with this study's oracle-bone pictogram-glyphs may be considered only two ways. Either they are recent specious fabrications, and by the measurable levels of repatination they exhibit, this certainly is not the case; or they are authentic examples of ancient Chinese writing.

2. Personal correspondence from Donald Graczyk, Chemist, Inorganic Analysis Technical Lead at Argonne National Laboratory, on the topic of "Dating Rock Art Repatination," (letter, May 17, 2013).

Following nine years of extensive fieldwork locating, documenting, and analyzing numerous sites, accompanied by comprehensive multidisciplinary review of the Native cultural and archaeological information available for each location, this investigative study has identified a significant number of ancient Chinese pictograms in the pre-Columbian North American rock writing record. Here is explicit tangible proof for the trans-Pacific transfer of Asiatic script to North America in pre-Columbian times.

Around AD 121, the Chinese scholar Xǔ Shèn presented his landmark document for organizing Chinese script, the *Shuōwén Jiězì* lexicon, to the Chinese emperor, Ān of Hán. In compiling this work, Xǔ did not follow a classification scheme based upon the meaning of each Chinese symbol. Rather, he arranged the individual symbols by the number of brush strokes (line strokes) required for writing each character.

Similar to Xǔ's taxonomy, this study employed the legal definition of artistic substantial similarity and the statistical tool of the Jaccard Index of Similarity, to compare the line stroke elements and inter-stroke touch relations of 107 pre-Columbian North American glyphs with those of corresponding historic Chinese pictograms. In each instance, the calculated value of Jaccard's Index confirms the substantial similarity of these paired symbols, with at least 95% confidence, demonstrating that the study glyphs are visually equivalent to ancient Chinese scripts. Supporting this conclusion, the world-renowned authority on ancient Chinese writing, David N. Keightley, Ph.D., has independently confirmed that several of the most complex images evaluated in this study are indeed readable ancient Chinese pictograms.

Worldwide, only a few complex symbols such as the swastika (Figures 112, 113, and 114) or what appears to be the depiction of the dead by inverted imagery (Figures 115 and 116), are thought to have been invented independently by unrelated populations. However, while universal symbols such as these have the same visual appeal, interpretations of them are not consistent and can vary widely. Consequently, universal symbols fail the basic requirement of this study's evaluative rubric, a rubric based upon the parameters first set forth for the interpretation of rock writing by Garrick Mallery in *Picture-Writing of the American Indians,* that for the valid interpretation of rock writing "the symbolic nature of the particular characters under examination is known or can be logically inferred from independent facts" (Mallery 1894:768). In contrast, the likelihood that all 107 of this study's pictogram-glyphs were created independently as ancient Chinese written symbols, solely by chance and separate from any prior knowledge of Chinese script, is nil (cumulative probability $< 6.1 \times 10^{-264}$).

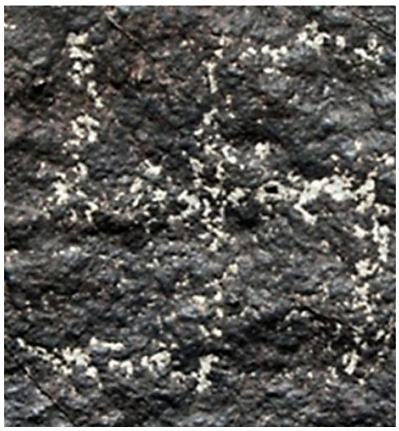


Figure 112
Swastika petroglyph
Three Rivers Petroglyph Site, New Mexico

Figure 113
Pottery swastika
Besh-Ba-Gowah Pueblo, New Mexico

Figure 114
Persian swastikas
Tall-i-Bakun, Iran

Figure 115
Native American petroglyph depiction of the dead
as an upside down stickman
Little Black Mountian, Arizona

Figure 116
Chinese depiction of the dead
as an upside down stickman
Image: L.Wieger

As it is no simple task to write in Chinese, the difficulty of doing so in America during the time when these glyphs were created, in some cases more than two thousand years ago, is not to be underestimated. Knowledge of Chinese script line strokes and their proper placement, a sizable pictographic vocabulary, and an understanding of Chinese syntax are necessary writing skills that are not easily acquired, nor mastered. Only individuals with considerable knowledge of ancient calligraphy could have created the multiple Chinese pictograms located at the study's widespread locations.

The study also found that, at more than one North American site, ancient Chinese scripts were placed upon rock surfaces in side-by-side linear pictographic patterns, identifiable as writing, or at the very least, proto-writing. The presence of these combined scripts informs us that whoever the authors were, they possessed a large Chinese vocabulary. Examples are: the vertical connection of the Zhōu and Yuān characters on the shore of Little Lake; the horizontal arrangement of Zhōu, Guǒ, Tián, and Chè pictograms across a single rock surface in Piedras Marcadas Canyon; and the botanical imagery of Mú and Guǒ, combined with the pictogram Shǒu in Chaco Canyon.

However, the most compelling and indisputable evidence that literate Chinese actually came to North America in pre-Columbian times is located in New Mexico's Petroglyph National Monument. Here pecked upon several large and physically unrelated boulders are multiple sets of oracle-bone and bronze era Chinese script symbols. One of these informs us of a traditional Chinese sacrificial offering; another record preserves a classic Shang dynasty period prognostication for the upcoming ten-day period; a third set of complex glyphs illustrates the composite ancient Chinese pictogram for a mesa.

Demonstrably, the Chinese writing sought by Henriette Mertz in the Americas has indeed been found at multiple sites across the continent. Significantly, the differing styles of ancient Chinese script (oracle-bone, bronze era, seal, and clerical) found at the study sites inform us that on multiple occasions, and in pre-Columbian times (approximately 1000 BC - AD 500), intellectual trans-Pacific exchanges took place between Native American and Asiatic populations.

Further, the identification of multiple styles of Chinese pictograms in American rock writing demonstrates that these pre-Columbian trans-Pacific interactions were ongoing; for as Chinese writing evolved examples of newer scripts also appear amongst the rock art of North America. Whether these intellectual exchanges were temporary, permanent, pre-planned or not, cannot be determined. However, modern multi-disciplinary research indicates that in addition to their genetic profiles, some Native American traditions, language, and folklore are of Asiatic origin (Davis 2001: 145; Keightley 1978: 4 n12).

In addition, the bilingual writing styles identified above Lyman Lake, in Nine Mile Canyon, and traversing the rock art panel below Kachina Bridge confirm that across vast portions of southwestern North America, over time, successive evolutionary forms of Chinese script were appropriated into Native rock writing.

Throughout history, whenever people from different cultures meet peacefully, they tend to exchange useful information. It would have been during such meetings that knowledge of Chinese script was shared with Native Americans. Without question, on more than one occasion Native Americans have incorporated Chinese characters into their own imagery. Consequently, wherever a Chinese pictogram appears as an isolate in American rock writing, surrounded by otherwise Native symbolism, most probably the figure is of Native authorship.

Significantly, the equally ancient yet differing sets of oracle-bone pictograms identified in the Petroglyph National Monument are located at important Native American astronomical and ceremonial sites (Rodriguez 2011). Certainly, whoever was permitted to write in Chinese script at these revered locations was extraordinarily important.

For the first time we can now read the stone diaries of these Asiatic authors. The implications of this new knowledge, that literate Chinese were present early on in North America, is at once compelling, multifaceted, and culturally profound. Curiously, both the ancient Chinese and Native Americans followed a ten-day weekly calendar (Zeilik 1986: S8), used the same set of colors for indicating the cardinal directions, and shared numerous additional customs and folklore.

While a number of authors have provided secondary evidence for early pre-Columbian visits by the Chinese to the Americas, it is equally possible that other Asiatic populations, such as the Japanese, Koreans, and Vietnamese, who employ styles of writing derived from Chinese script, were responsible for at least some of these cultural exchanges. Nevertheless, the earliest styles of the North American pictogram-glyphs identified in this study originated in China.

On November 13, 2013 a highly knowledgeable senior representative of the National Park Service personally evaluated the study petroglyphs located in Rinconada Canyon and stated the following:

A. The petroglyph similar to the Liángzhǔ emblem is likely archaic and of a scratched style not associated with other glyphs in the Petroglyph National Monument. With its rounded head, legs without feet, extensively detailed

feathering, and a relatively small beak, this drawing of a bird is significantly different from the other avian depictions found within the Monument.

B. The readable message of the Xiàn, Quǎn, Dà, Jié, Gēng, and Dà Jiǎ petroglyphs (Chinese script images confirmed by Keightley) exhibit some repecking. Nevertheless, all display discernible repatination consistent with old age. Hence, these symbols cannot be recent specious fabrications.

C. The Rinconada Canyon boulder upon which the Xún and Jí glyphs are located exhibits evidence that at some time in the past it may have toppled over approximately 90 degrees to the east, resulting in the horizontal arrangement of these petroglyphs.

D. The Chinese script petroglyphs of Huā, Tǔ, Xiàn, Quǎn, Dà Jiǎ, Gēng, Xún, and Jí found in Rinconada Canyon are not symbols known to be associated with any local Native tribe.

In summation, the comparative pictogram-glyph data presented in this manuscript, and appearing with analytical detail in Appendix A, establishes that:

1. The identification of readable sets of Chinese oracle-bone script in the North American rock writing record verifies that literate Chinese were present in the Americas during or shortly following the reign of China's Shang dynasty (c. 1500 - 1040 BC);

2. The line stroke features of the study's 107 pictogram-glyphs, representing four primary styles of historic Chinese script, indicate that on multiple occasions, likely spanning thousands of years, literate Asiatic people were periodically entering North America;

3. Native Americans appropriated elements of Chinese script into their own writings; and that,

4. The distribution of ancient Chinese script imagery across North America supports both the migration folklore of Native Americans and ancient Chinese records such as the *Juǎn* 327 and *Shān Hǎi Jīng*.

Unquestionably, the study's North American pictogram-glyphs were not written in isolation, but were purposefully created to be viewed, read, and widely understood in an open script environment. Fortunately, although they are now weathered and repatinated, these glyphs are still readable. With continued research and use of newly developed electronic recognition software to evaluate the digital rock art data already stockpiled, additional interpretations and a better understanding of the historical information preserved by the ancient Chinese pictograms embedded within North American rock writing should be possible.

Appendix A

Pictogram-glyph Comparison Charts

Summary of Pictogram-glyph Comparisons

Chart	Pictogram Style	Location of Glyph	*J*	P	N	Page
1	Oracle-bone Zhōu	El Morro	0.8824	< 0.001	17	94
2	Oracle-bone Zhōu	Lagomarsino	0.7500	< 0.001	20	95
3	Oracle-bone Zhōu	Piedras Marcadas Canyon	0.7647	0.001	17	96
4	Oracle-bone Zhōu	Kachina Bridge	0.7500	< 0.001	20	97
5	Oracle-bone Zhōu	Lyman Lake	0.8333	< 0.001	18	98
6	Oracle-bone Zhōu	Arlington	0.7500	< 0.001	20	99
7	Seal era Zhōu	Little Lake	0.7059	< 0.01	17	100
8	Seal era Zhōu	Little Colorado River	0.7059	< 0.01	17	101
9	Seal era Zhōu	Petroglyphs Provincial Park	0.7059	< 0.01	17	102
10	Seal era Zhōu	Anasazi Ridge	0.5714	0.05	21	103
11	Clerical style Zhōu	Nine Mile Canyon	0.6190	0.01	21	104
12	Bronze era Shuĭ	Anza Borrego	1.0000	< 0.001	17	105
13	Oracle-bone Yuān	Little Lake	1.0000	< 0.001	14	106
14	Oracle-bone Mù	Oriental Institute	1.0000	< 0.001	9	107
15	Oracle-bone Mù	Red Canyon	0.8889	0.001	9	108
16	Seal era Mù	Red Canyon	0.8889	0.001	9	109
17	Bronze era Mù	Chaco Canyon	1.0000	< 0.001	9	110
18	Bronze era Wèi	Painted Rocks	1.0000	< 0.001	13	111
19	Oracle-bone Guŏ	Lyman Lake	0.7273	0.01	11	112
20	Seal era Guŏ	Valley of Fire	0.8462	0.001	13	113
21	Oracle-bone Cì	Oklahoma	1.0000	< 0.001	19	114
22	All eras Tián	Piedras Marcadas Canyon	0.9091	< 0.001	11	115
23	Oracle-bone Zhōu	Valley of Fire	0.8182	< 0.01	11	116
24	Oracle-bone Wèi	Valley of Fire	0.7143	0.001	21	117
25	Oracle-bone Guŏ	Piedras Marcadas Canyon	0.8182	< 0.01	11	118
26	Oracle-bone Chĭ	Grapevine Canyon	0.9211	< 0.001	38	119
27	Seal era Cì	St. Johns, Arizona	1.0000	< 0.001	19	121
28	Oracle-bone Wén	Jeffers Petroglyphs Park	1.0000	0.001	8	122
29	Oracle-bone Wén	Boca Negra Canyon	0.7273	0.01	11	123
30	Seal era Quăn	Rinconada Canyon	0.6667	0.01	15	124

- Chart continued on next page -

Summary of Pictogram-glyph Comparisons

- Continued from previous page -

Chart	Pictogram Style	Location of Glyph	*J*	P	N	Page
31	Seal era Huā	Rinconada Canyon	0.7778	< 0.001	27	125
32	Seal era Zhōu	Petrified Forest National Park	0.8235	< 0.001	17	127
33	Bronze era Shuǐ	Petrified Forest National Park	1.0000	< 0.001	17	128
34	Oracle-bone Mì	Petrified Forest National Park	0.6667	0.01	18	129
35	Bronze era Xiàng	Petrified Forest National Park	0.5172	0.05	29	130
36	Bronze era Shǒu	Chaco Canyon	0.7647	0.001	17	133
37	Oracle-bone Quǎn	Grapevine Canyon	0.7143	0.001	21	134
38	Oracle-bone Yuān	Grapevine Canyon	1.0000	< 0.001	14	135
39	Seal era Huā	Little Colorado River	0.6522	< 0.01	23	136
40	Oracle-bone Mì	Little Colorado River	0.6667	< 0.001	33	137
41	Oracle-bone Péng	Boca Negra Canyon	0.6786	< 0.001	56	138
42	Oracle-bone Péng	Rinconada Canyon	1.0000	< 0.001	9	140
43	Oracle-bone Péng	Rinconada Canyon	1.0000	< 0.001	9	141
44	Oracle-bone Wén	Coal Canyon, Utah	0.6667	0.05	12	142
45	Seal era Tǔ	Rinconada Canyon	1.0000	0.01	5	143
46	Oracle-bone Jí	Rinconada Canyon	0.7500	0.05	8	144
47	Oracle-bone Dà Jiǎ	Rinconada Canyon	0.8000	0.05	5	145
48	Bronze era Gào	Piedras Marcadas Canyon	0.8125	< 0.001	16	146
49	Bronze era Wǔ	Piedras Marcadas Canyon	1.0000	< 0.001	9	147
50	Bronze era Xiàn	Rinconada Canyon	1.0000	0.001	7	148
51	Oracle-bone Gēng	Rinconada Canyon	0.6667	0.01	15	149
52	Liángzhǔ Emblem	Rinconada Canyon	0.6129	< 0.01	31	150
53	Oracle-bone Xún	Rinconada Canyon	1.0000	0.01	5	152
54	Bronze era Chè	Piedras Marcadas Canyon	1.0000	0.01	5	153

Key

J = Calculated value of the Jaccard Index of Similarity

P = Probability for the calculated value of *J* occurring by chance

N = Total number of line stroke and touch relation attributes

Chart 1
Chinese Zhōu (boat) Pictogram vs. El Morro Petroglyph

Oracle-bone Zhōu pictogram
Image: Bernhard Karlgren

El Morro glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**El Morro glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Horizontal #1 (bow)	Yes
Horizontal #2 (bow thwart)	Horizontal #2 (bow thwart)	Yes
Horizontal #3 (midship thwart)	Horizontal #3 (midship thwart)	Yes
Horizontal #4 (stern)	Horizontal #4 (stern)	Yes
None	Wavy line (water)	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**El Morro glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
Junction - horizontal #1& vertical #1	Junction - horizontal #1& vertical #1	Yes
Junction - horizontal #1 & vertical #2	Junction - horizontal #1& vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 &vertical #2	Yes
Junction - horizontal #3 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #3 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #4 & vertical #1	Yes
Junction - horizontal #4 & vertical #2	Junction - horizontal #4 & vertical #2	Yes
None	Wavy line - connection vertical #2	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the El Morro petroglyph

Total number of shared features M11 = 15
Total number of features N = 17
For Index of Similarity calculation: M10 = 0; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{0 + 2 + 15} = \frac{15}{17} = 0.8824$$

For N = 17 and $J = 0.8824$; $P < 0.001$

Chart 2
Chinese Zhōu (boat) Pictogram vs. Lagomarsino Petroglyph

Oracle-bone Zhōu pictogram
Image: Bernhard Karlgren

Lagomarsino glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Lagomarsino glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
None	Horizontal #1 (bow)	No
Horizontal #1 (bow thwart)	Horizontal #2 (bow thwart)	Yes
Horizontal #2 (midship thwart)	Horizontal #3 (midship thwart)	Yes
Horizontal #3 (stern thwart)	Horizontal #4 (stern thwart)	Yes
Horizontal #4 (stern)	Horizontal #5 (stern)	Yes
None	Two wavy lines (water)	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Lagomarsino glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - horizontal #1 & vertical #1	No
None	Connection - horizontal #1& vertical #2	No
Junction - horizontal #1& vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #1 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #3 & vertical #2	Yes
Junction - horizontal #3 & vertical #1	Junction - horizontal #4 & vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #4 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #5 & vertical #1	Yes
Junction - horizontal #4 & vertical #2	Junction - horizontal #5 & vertical #2	Yes
None	Connection - two wavy lines & vertical #1	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Lagomarsino petroglyph

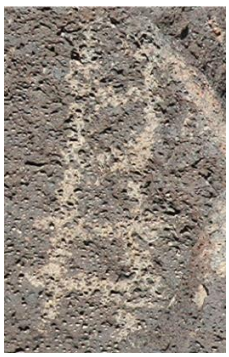
Total number of shared features M11 = 15
Total number of features N = 20
For Index of Similarity calculation: M10 = 0; M01 = 5

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{0 + 5 + 15} = \frac{15}{20} = 0.7500$$

For N = 20 and $J = 0.7500$; $P < 0.001$

Chart 3
Chinese Zhōu (boat) Pictogram vs. Piedras Marcadas Canyon Petroglyph

Oracle-bone Zhōu pictogram
Image: Bernhard Karlgren



Piedras Marcadas Canyon glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Piedras Marcadas Canyon glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Horizontal #1 (bow)	Yes
Horizontal #2 (bow thwart)	Horizontal #2 (bow thwart)	Yes
Horizontal #3 (midship thwart)	Horizontal #3 (midship thwart)	Yes
Horizontal #4 (stern)	Horizontal #4 (stern)	Yes
None	Wavy line (water)	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Piedras Marcadas Canyon glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
Junction - horizontal #1 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
Junction - horizontal #1 & vertical #2	Junction - horizontal #1 & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #3 & vertical #1	Intersection - horizontal #3 & vertical #1	No
Junction - horizontal #3 & vertical #2	Junction - horizontal #3 & junction vertical #2	Yes
Junction - horizontal #4 & vertical #1	Intersection - horizontal #4 & vertical #1	No
Junction - horizontal #4 & vertical #2	Junction - horizontal #4 & junction vertical #2	Yes
None	Connection - wavy line & vertical #2	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Piedras Marcadas petroglyph

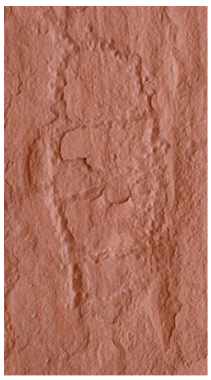
Total number of shared features M11 = 13
Total number of features N = 17
For Index of Similarity calculation: M10 = 2; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{13}{2 + 2 + 13} = \frac{13}{17} = 0.7647$$

For N = 17 and $J = 0.7647$; P = 0.001

Chart 4
Chinese Zhōu (boat) Pictogram vs. Kachina Bridge Petroglyph

Oracle-bone Zhōu pictogram
Image: Bernhard Karlgren



Kachina Bridge glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Kachina Bridge glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
None	Arc down (bow)	No
Horizontal #1 (bow thwart)	Horizontal #1 (bow thwart)	Yes
Horizontal #2 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #3 (stern thwart)	Horizonal #3 (stern thwart)	Yes
Horizontal #4 (stern)	Horizontal #4 (stern)	Yes
None	Wavy lines (water)	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Kachina Bridge glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - arc down & vertical #1	No
None	Connection - arc down & vertical #2	No
Junction - horizontal #1 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
Junction - horizontal #1 & vertical #2	Junction - horizontal #1 & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #3 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #3 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #4 & vertical #1	Yes
Junction - horizontal #4 & vertical #2	Junction - horizontal #4 & vertical #2	Yes
None	Connection - wavy line & arc down	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Kachina Bridge petroglyph

Total number of shared features M11 = 15
Total number of features N = 20
For Index of Similarity calculation: M10 = 0; M01 = 5

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{0 + 5 + 15} = \frac{15}{20} = 0.7500$$

For N = 20 and $J = 0.7500$; $P < 0.001$

Chart 5
Chinese Zhōu (boat) Pictogram vs. Lyman Lake Petroglyph

Oracle-bone Zhōu pictogram
Image: Bernhard Karlgren

Lyman Lake glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	Lyman Lake glyph line strokes and analogous boat descriptors	Shared Feature
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
None	Arc down (bow)	No
Horizontal #1 (bow thwart)	Horizontal #1 (bow thwart)	Yes
Horizontal #2 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #3 (stern thwart)	Horizontal #3 (stern thwart)	Yes
Horizontal #4 (stern)	Horizontal #4 (stern)	Yes

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	Lyman Lake glyph line stroke relations	Shared Relation
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - arc down & vertical #1	No
None	Connection - arc down & vertical #2	No
Junction - horizontal #1 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
Junction - horizontal #1 & vertical #2	Junction - horizontal #1 & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #3 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #3 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #4 & vertical #1	Yes
Junction - horizontal #4 & vertical #2	Junction - horizontal #4 & vertical #2	Yes

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Lyman Lake petroglyph

Total number of shared features M11 = 15
Total number of features N = 18
For Index of Similarity calculation: M10 = 0; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{0 + 3 + 15} = \frac{15}{18} = 0.8333$$

For N=18 and J =0.8333; $P < 0.001$

Chart 6
Chinese Zhōu (boat) Pictogram vs. Arlington, Arizona Petroglyph

Oracle-bone Zhōu pictogram
Image: Bernhard Karlgren

Arlington glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Arlington glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
None	Arc down (bow)	No
Horizontal #1 (bow thwart)	Horizontal #1 (bow thwart)	Yes
Horizontal #2 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #3 (stern thwart)	Horizontal #3 (stern thwart)	Yes
Horizontal #4 (stern)	Horizontal #4 (stern)	Yes
None	Wavy line (water)	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Arlington glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - arc down & vertical #1	No
None	Connection - arc down & vertical #2	No
Junction - horizontal #1 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
Junction - horizontal #1 & vertical #2	Junction - horizontal #1 & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #3 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #3 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #4 & vertical #1	Yes
Junction - horizontal #4 & vertical #2	Junction - horizontal #4 & vertical #2	Yes
None	Connection - wavy line & vertical #2	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Arlington, Arizona petroglyph

Total number of shared features M11 = 15
Total number of features N = 20
For Index of Similarity calculation: M10 = 0; M01 = 5

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{0 + 5 + 15} = \frac{15}{20} = 0.7500$$

For N = 20 and $J = 0.7500$; $P < 0.001$

Chart 7
Chinese Zhōu (boat) Pictogram vs. Little Lake Petroglyph

Seal era Zhōu pictogram
Image: Richard Sears

Little Lake glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Little Lake glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Arc down (bow)	No
Horizontal #2 (bow thwart)	Horizontal #1 (bow thwart)	Yes
Horizontal #3 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #4 (stern)	Horizontal #3 (stern)	Yes
Wavy line (water)	Wavy line (water)	Yes

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Little Lake glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - arc down & vertical #1	No
Connection - horizontal #1 & vertical #2	Connection - arc down & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
None	Junction - horizontal #1 & vertical #2	No
Junction - horizontal #3 & vertical #1	Junction - horizontal #2& vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
None	Junction - horizontal #3 & vertical #2	No
Connection - wavy line & horizontal #1	Junction - wavy line & arc down	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Little Lake petroglyph

Total number of shared features M11 = 12
Total number of features N = 17
For Index of Similarity calculation: M10 = 2; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{12}{2 + 3 + 12} = \frac{12}{17} = 0.7059$$

For N = 17 and $J = 0.7059$; $P < 0.01$

Chart 8
Chinese Zhōu (boat) Pictogram vs. Little Colorado River Petroglyph

Seal era Zhōu pictogram
Image: Richard Sears

Little Colorado River glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Little Colorado River glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Arc down (bow)	No
Horizontal #2 (bow thwart)	Horizontal #1 (bow thwart)	Yes
Horizontal #3 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #4 (stern)	Horizontal #3 (stern)	Yes
Wavy line (water)	Wavy line (water)	Yes

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Little Colorado River glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - arc down & vertical #1	No
Connection - horizontal #1 & vertical #2	Connection - arc down & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
None	Junction - horizontal #1 & vertical #2	No
Junction - horizontal #3 & vertical #1	Junction - horizontal #2& vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
None	Junction - horizontal #3 & vertical #2	No
Connection - wavy line & horizontal #1	Connection - wavy line & Vertical #2	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Little Colorado River petroglyph

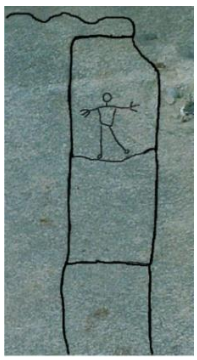
Total number of shared features M11 = 12
Total number of features N = 17
For Index of Similarity calculation: M10 = 2; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{12}{2 + 3 + 12} = \frac{12}{17} = 0.7059$$

For N = 17 and $J = 0.7059$; $P < 0.01$

Chart 9
Chinese Zhōu (boat) Pictogram vs. Petroglyphs Provincial Park Petroglyph

Seal era Zhōu pictogram
Image: Richard Sears



Petroglyphs Provincial Park glyph
(trace lines added)

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Petroglyphs Provincial Park glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Horizontal #1 (bow)	Yes
Horizontal #2 (bow thwart)	None	No
Horizontal #3 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #4 (stern)	Horizontal #3 (stern)	Yes
Wavy line (water)	Wavy line (water)	Yes
None	Anthropomorph	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Petroglyphs Provincial Park glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - horizontal #1 & vertical #1	No
Connection - horizontal #1 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
None	Junction - horizontal #2 & vertical #2	No
Junction - horizontal #3 & vertical #1	Junction - horizontal #3& vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #3 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	None	No
Connection - wavy line & horizontal #1	Connection - wavy line & horizontal #1	Yes

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Petroglyphs Provincial Park petroglyph

Total number of shared features M11 = 12
Total number of features N = 17
For Index of Similarity calculation: M10 = 2; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{12}{2 + 3 + 12} = \frac{12}{17} = 0.7059$$

For N = 17 and $J = 0.7059$; $P < 0.01$

Chart 10
Chinese Zhōu (boat) Pictogram vs. Anasazi Ridge Petroglyph

Seal era Zhōu pictogram
Image: Richard Sears

Anasazi Ridge glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Anasazi Ridge glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Arc down (bow)	No
Horizontal #2 (bow thwart)	Horizontal #1 (bow thwart)	Yes
Horizontal #3 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #4 (stern)	Horizontal #3 (stern)	Yes
Wavy line (water)	Wavy line (water)	Yes
None	Five diagonal line cluster	No
None	Anthropomorph	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Anasazi Ridge glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - arc down & vertical #1	No
Connection - horizontal #1 & vertical #2	Connection - arc down & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
None	Junction - horizontal #1 & vertical #2	No
Junction - horizontal #3 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
None	Junction - horizontal #3 & vertical #2	No
Connection - wavy line & horizontal #1	Junction - wavy line & vertical #2	No
None	Placement - five diagonal line cluster… within midsection	No
None	Placement - anthropomorph within bottom section	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Anasazi Ridge petroglyph

Total number of shared features M11 = 12
Total number of features N = 21
For Index of Similarity calculation: M10 = 2; M01 = 7

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{12}{2 + 7 + 12} = \frac{12}{21} = 0.5714$$

For N = 21 and $J = 0.5714$; P = 0.05

Chart 11
Chinese Zhōu (boat) Pictogram vs. Nine Mile Canyon Petroglyph

Clerical Script Zhōu pictogram
Image: Frank Chalfant

Nine Mile Canyon glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Nine Mile Canyon glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Arc down (bow)	No
Horizontal #2 (midship thwart-extended)	Horizontal (midshipt thwart-extended)	Yes
Diagonal up (above horizontal #1)	Dot (above arc down)	No
Diagonal down #1 (within top box)	Five geometric sub-divisions (within top box)	No
Diagonal down #2 (within bottom box)	Anthropomorph (within bottom box)	No
Diagonal down #3 (right hook / stern)	Arc up (stern)	Yes
Water line (vertical left extension)	3 water lines (between side strakes)	Yes

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Nine Mile Canyon glyph line stroke relations**	**Shared Relation**
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
Connection - horizontal #1 & vertical #1	Connection - arc down & vertical #1	Yes
Connection - horizontal #1 & vertical #2	Connection - arc down & vertical #2	Yes
Intersection - horizontal #2 & vertical #1	Intersection - horizontal & vertical #1	Yes
Intersection - horizontal #2 & vertical #2	Intersection - horizontal & vertical #2	Yes
Placement - diagonal up above horizontal #1	Placement - dot, circles and lines above arc down	Yes
Placement - diagonal down #1 in top box	Placement - five geometric sub-divisions in top box	Yes
Placement - diagonal down #2 in bottom box	Placement - anthropomorph in bottom box	Yes
Connection - diagonal down #3 & vertical	None	No
None	Intersection - arc up & vertical	No
None	Intersection - arc up & vertical	No
Water line - connection vertical left	3 water lines - between verticals	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Nine Mile Canyon petroglyph

Total number of shared features M11 = 13
Total number of features N = 21
For Index of Similarity calculation: M10 = 6; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{13}{6 + 2 + 13} = \frac{13}{21} = 0.6190$$

For N = 21 and $J = 0.6190$; P = 0.01

Chart 12
Chinese Shuĭ (water) Pictogram vs. Anza Borrego Pictograph

Bronze era Shuĭ pictogram
Image: Frank Chalfant

Anza Borrego pictograph
enhanced by DStretch

Part 1. Comparison of line strokes

Shuĭ pictogram line strokes	**Anza Borrego pictograph line strokes**	**Shared Feature**
Diagonal set #1 (alternating down-up-down)	Diagonal set #1 (alternating down-up-down)	Yes(x3)
Diagonal set #2 (alternating down-up-down)	Diagonal set #2 (alternating down-up-down)	Yes(x3)
Diagonal set #3 (alternating down-up-down)	Diagonal set #3 (alternating down-up-down)	Yes(x3)

Part 2. Comparison of line stroke touch relations

Shuĭ pictogram line stroke relations	**Anza Borrego line stroke relations**	**Shared Relation**
Connections - diagonal set #1 down-up-down	Connections - diagonal set #1down-up-down	Yes (x2)
Connections - diagonal set #2 down-up-down	Connections - diagonal set #2 down-up-down	Yes (x2)
Connections - diagonal set #3 down-up-down	Connections - diagonal set #3 down-up-down	Yes (x2)
Placement - diagonal set #1 in phase with … diagonal set #2	Placement - diagonal set #1 in phase with … diagonal set #2	Yes
Placement - diagonal set #2 in phase with … diagonal set #3	Placement - diagonal set #2 in phase with … diagonal set #3	Yes

Calculation of Jaccard's Index for the comparison of the Shuĭ pictogram with the Anza Borrego pictograph

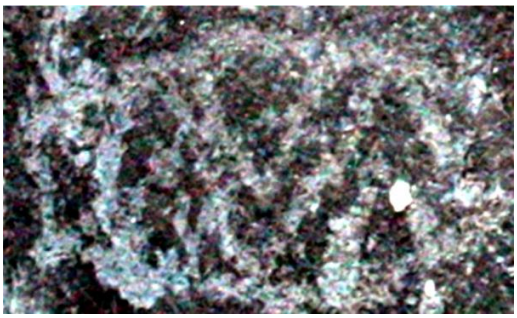
Total number of shared features M11 = 17
Total number of features N = 17
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{17}{0 + 0 + 17} = \frac{17}{17} = 1.0000$$

For N = 17 and $J = 1.0000$; $P < 0.001$

Chart 13
Chinese Yuān (pond) Pictogram vs. Little Lake Petroglyph

Oracle-bone Yuān pictogram
Image: Frank Chalfant



Little Lake glyph

Part 1. Comparison of line strokes

Yuān pictogram line strokes	Little Lake glyph line strokes	Shared Feature
Wavy line #1 (top)	Wavy line #1 (top)	Yes
Wavy line #2 (middle)	Wavy line #2 (middle)	Yes
Wavy line #3 (bottom)	Wavy line #3 (bottom)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Vertical #1 (left)	Vertical #1 (top)	Yes
Vertical #2 (right)	Vertical #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Yuān pictogram line stroke relations	Little Lake glyph line stroke relations	Shared Relation
Parallel - wavy line #1 & in phase … with wavy line #2	Parallel - wavy line #1 & in phase … with wavy line #2	Yes
Parallel - wavy line #2 & in phase … with wavy line #3	Parallel - wavy line #2 & in phase … with wavy line #3	Yes
Connection - horizontal #1 & vertical #1	Connection - horizontal #1 & vertical #1	Yes
Connection - horizontal #1 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - horizontal #2 & vertical #1	Connection - horizontal #2 & vertical #1	Yes
Connection - horizontal #2 & vertical #2	Connection - horizontal #2 & vertical #2	Yes
Placement - wavy lines within cartouche	Placement - wavy lines within cartouche	Yes

Calculation of Jaccard's Index for the comparison of the Yuān pictogram with the Little Lake petroglyph

Total number of shared features M11 = 14
Total number of features N = 14
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{14}{0 + 0 + 14} = \frac{14}{14} = 1.0000$$

For N = 14 and $J = 1.0000$; $P < 0.001$

Chart 14
Chinese Mù (tree) Pictogram vs. Actual Oracle-bone Script Mù

Oracle-bone Mù pictogram
Image: Frank Chalfant

Oracle-bone script Mù

Part 1. Comparison of line strokes

Mù pictogram line strokes and analogous tree descriptors	**Oracle-bone scriipt Mù line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Curve-up #1(left branch)	Curve-up #1 (left branch)	Yes
Curve-up #2 (right branch)	Curve-up #2 (right branch)	Yes
Diagonal up (left root)	Diagonal up (left root)	Yes
Diagonal down (right root)	Diagonal down (right root)	Yes

Part 2. Comparison of line stroke touch relations

Mù pictogram line stroke relations	**Oracle-bone Mù script line stroke relations**	**Shared Relation**
Junction - curve-up #1 & vertical	Junction - curve-up #1& vertical	Yes
Junction - curve-up #2 & vertical	Junction - curve-up #2 & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up & vertical	Yes
Junction - diagonal down & vertical	Junction - diagonal down & vertical	Yes

Calculation of Jaccard's Index for the comparison of the oracle-bone Mù pictogram with the oracle-bone script Mù symbol

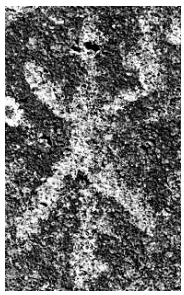
Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 15
Chinese Mù (tree) Pictogram vs. Red Canyon Petroglyph

Oracle-bone Mù pictogram
Image: Frank Chalfant



Red Canyon glyph

Part 1. Comparison of line strokes

Mù pictogram line strokes and analogous tree descriptors	**Red Canyon glyph line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Curve-up #1 (left branch)	Diagonal up #1 (left branch)	No
Curve-up #2 (right branch)	Curve-up (right branch)	Yes
Diagonal up (left root)	Diagonal up #2 (left root)	Yes
Diagonal down (right root)	Diagonal down (right root)	Yes

Part 2. Comparison of line stroke touch relations

Mù pictogram line stroke relations	**Red Canyon glyph line stroke relations**	**Shared Relation**
Junction - curve-up #1 & vertical	Junction - diagonal up #1 & vertical	Yes
Junction - curve-up #2 & vertical	Junction - curve-up & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up #2 & vertical	Yes
Junction - diagonal down & vertical	Junction - diagonal down & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Mù pictogram with the Red Canyon petroglyph

Total number of shared features M11 = 8
Total number of features N = 9
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{1 + 0 + 8} = \frac{8}{9} = 0.8889$$

For N = 9 and $J = 0.8889$; P = 0.001

Chart 16
Chinese Mù (tree) Pictogram vs. Red Canyon Petroglyph

Seal era Mù pictogram
Image: Frank Chalfant

Red Canyon glyph

Part 1. Comparison of line strokes

Mù pictogram line strokes and analogous tree descriptors	**Red Canyon glyph line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Curve-up #1 (left branch)	Curve-up #1 (left branch)	Yes
Curve-up #2 (right branch)	Curve-up #2 (right branch)	Yes
Curve-down #1 (left root)	Curve-down (left root)	Yes
Curve-down #2 (right root)	Diagonal down (right root)	No

Part 2. Comparison of line stroke touch relations

Mù pictogram line stroke relations	**Red Canyon glyph line stroke relations**	**Shared Relation**
Junction - curve-up #1 & vertical	Junction - curve-up #1 & vertical	Yes
Junction - curve-up #2 & vertical	Junction - curve-up #2 & vertical	Yes
Junction - curve-down #1 & vertical	Junction - curve-down & vertical	Yes
Junction - curve-down #2 & vertical	Junction - diagonal down & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Mù pictogram with the Red Canyon petroglyph

Total number of shared features M11 = 8
Total number of features N = 9
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{1 + 0 + 8} = \frac{8}{9} = 0.8889$$

For N = 9 and $J = 0.8889$; P = 0.001

Chart 17
Chinese Mù (tree) Pictogram vs. Chaco Canyon Petroglyph

Bronze era Mù pictogram
Image: Richard Sears

Chaco Canyon glyph

Part 1. Comparison of line strokes

Mù pictogram line strokes and analogous tree descriptors	**Chaco Canyon glyph line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down #1(left branch)	Diagonal down #1 (left branch)	Yes
Curve-up (right branch)	Curve-up (right branch)	Yes
Diagonal up (left root)	Diagonal up (left root)	Yes
Diagonal down #2 (right root)	Diagonal down #2 (right root)	Yes

Part 2. Comparison of line stroke touch relations

Mù pictogram line stroke relations	**Chaco Canyon glyph line stroke relations**	**Shared Relation**
Junction - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	Yes
Junction - curve-up & vertical	Junction - curve-up & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down #2 & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Mù pictogram with the Chaco Canyon petroglyph

Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 18
Chinese Wèi (large tree) Pictogram vs. Painted Rocks Petroglyph

Bronze era Wèi pictogram
Image: Richard Sears

Painted Rocks glyph

Part 1. Comparison of line strokes

Wèi pictogram line strokes and analogous tree descriptors	**Painted Rocks glyph line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Curve-up left #1 (top branch)	Curve-up left #1 (top branch)	Yes
Curve-up right #1 (top branch)	Curve-up right #1 (top branch)	Yes
Curve-up left #2 (lower branch)	Curve-up left #2 (lower branch)	Yes
Curve-up right #2 (lower branch)	Curve-up right #2 (lower branch)	Yes
Diagonal up (left root)	Diagonal up (left root)	Yes
Diagonal down (right root)	Diagonal down (right root)	Yes

Part 2. Comparison of line stroke touch relations

Wèi pictogram line stroke relations	**Painted Rocks glyph line stroke relations**	**Shared Relation**
Junction - curve-up left #1 & vertical	Junction - curve-up left #1 & vertical	Yes
Junction - curve-up right #1 & vertical	Junction - curve-up right #1 & vertical	Yes
Junction - curve-up left #2 & vertical	Junction - curve-up left #2 & vertical	Yes
Junction - curve-up right #2 & vertical	Junction - curve-up right #2 & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up & vertical	Yes
Junction - diagonal down & vertical	Junction - diagonal down & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Wèi pictogram with the Painted Rocks petroglyph

Total number of shared features M11 = 13
Total number of features N = 13
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{13}{0 + 0 + 13} = \frac{13}{13} = 1.0000$$

For N = 13 and $J = 1.0000$; $P < 0.001$

Chart 19
Chinese Guǒ (fruit tree) Pictogram vs. Lyman Lake Petroglyph

Oracle-bone Guǒ pictogram
Image: Richard Sears

Lyman Lake glyph

Part 1. Comparison of line strokes

Guǒ Pictogram line strokes and analogous tree descriptors	**Lyman Lake glyph line strokes and analogous tree descriptors**	**Shared Relation**
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down #1 (left branch)	Curve-up (left branch)	No
Curve-up (right branch)	None	No
Circle (fruit)	Circle (fruit)	Yes
Diagonal up (left root)	Diagonal up (left root)	Yes
Diagonal down #2 (right root)	Diagonal down (right root)	Yes

Part 2. Comparison of line stroke touch relations

Guǒ pictogram line stroke relations	**Lyman Lake glyph line stroke relations**	**Shared Relation**
Junction - diagonal down #1 & circle	Junction - curve-up & circle	Yes
Junction - curve-up & vertical	None	No
Connection - circle & vertical	Connection - circle & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Guǒ pictogram with the Lyman Lake petroglyph

Total number of shared features M11 = 8
Total number of features N = 11
For Index of Similarity calculation: M10 = 3; M01 = 01

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{3 + 0 + 8} = \frac{8}{11} = 0.7273$$

For N = 11 and $J = 0.7273$; P = 0.01

Chart 20
Chinese Guǒ (fruit tree) Pictogram vs. Valley of Fire Petroglyph

Seal era Guǒ pictogram
Image: Frank Chalfant

Valley of Fire glyph

Part 1. Comparison of line strokes

Guǒ pictogram line strokes and analogous tree descriptors	**Valley of Fire glyph line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Curve-up #1 (left branch)	Curve-up #1 (left branch)	Yes
Curve-up #2 (right branch)	Curve-up #2 (right branch)	Yes
Circle (fruit)	Circle (fruit)	Yes
Diagonal up (left root)	Diagonal up (left root)	Yes
Diagonal down (right root)	Diagonal down (right root)	Yes
Dot	None	No

Part 2. Comparison of line stroke touch relations

Guǒ pictogram line stroke relations	**Valley of Fire glyph line stroke relations**	**Shared Relation**
Connection - circle & vertical	Connection - circle & vertical	Yes
Junction - curve-up #1 & vertical	Junction - curve-up #1 & vertical	Yes
Junction - curve-up #2 & vertical	Junction - curve-up #2 & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up & vertical	Yes
Junction - diagonal down & vertical	Junction - diagonal down & vertical	Yes
Placement - dot within circle	None	No

Calculation of Jaccard's Index for the comparison of the Guǒ pictogram with the Valley of Fire petroglyph

Total number of shared features M11 = 11
Total number of features N = 13
For Index of Similarity calculation: M10 = 2; M01= 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{11}{2 + 0 + 11} = \frac{11}{13} = 0.8462$$

For N = 13 and $J = 0.8462$; P = 0.001

Chart 21
Chinese Cì (thorn) Pictogram vs. Oklahoma Petroglyph

Oracle-bone Cì pictogram
Image: Richard Sears

Oklahoma glyph

Part 1. Comparison of line strokes

Cì pictogram line strokes and analogous thorn descriptors	**Oklahoma glyph line strokes and analogous thorn descriptors**	**Shared Feature**
Vertical (central stem)	Vertical (central stem)	Yes
Horizontal (central branch)	Horizontal (central branch)	Yes
Diagonal down #1 (top left thorn)	Diagonal down #1 (top left thorn)	Yes
Diagonal up #1 (top right thorn)	Diagonal up #1 (top right thorn)	Yes
Diagonal up #2 (left root)	Diagonal up #2 (left root)	Yes
Diagonal down #2 (right root)	Diagonal down #2 (right root)	Yes
Diagonal up #3 (left thorn bottom)	Diagonal up #3 (left thorn bottom)	Yes
Diagonal down #3 (left thorn top)	Diagonal down #3 (left thorn top)	Yes
Diagonal up #4 (right thorn top)	Diagonal up #4 (right thorn top)	Yes
Diagonal down #4 (right thorn bottom)	Diagonal down #4 (right thorn bottom)	Yes

Part 2. Comparison of line stroke touch relations

Cì pictogram line stroke relations	**Oklahoma glyph line stroke relations**	**Shared Relation**
Intersection - horizontal & vertical	Intersection - horizontal & vertical	Yes
Connection - diagonal down #1 & vertical	Connection - diagonal down #1 & vertical	Yes
Connection - diagonal up #1 & vertical	Connection - diagonal up #1 & vertical	Yes
Junction - diagonal up #2 & vertical	Junction - diagonal up #2 & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down #2 & vertical	Yes
Connection - diagonal up #3 & horizontal	Connection - diagonal up #3 & horizontal	Yes
Connection -diagonal down #3 & horizontal	Connection - diagonal down #3 & horizontal	Yes
Connection - diagonal up #4 & horizontal	Connection - diagonal up #4 & horizontal	Yes
Connection - diagonal down #4 & horizontal	Connection - diagonal down & horizontal	Yes

Calculation of Jaccard's Index for the comparison of the Cì pictogram with the Oklahoma petroglyph

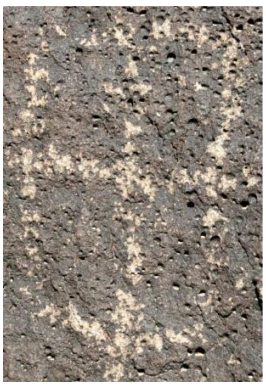
Total number of shared features M11 = 19
Total number of features N = 19
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{19}{0 + 0 + 19} = \frac{19}{19} = 1.0000$$

For N = 19 and $J = 1.0000$; $P < 0.001$

Chart 22
Chinese Tián (field) Pictogram vs. Piedras Marcadas Canyon Petroglyph

All eras Tián pictogram
Image: Richard Sears



Piedras Marcadas Canyon glyph

Part 1. Comparison of line strokes

Tián pictogram line strokes	Piedras Marcadas Canyon glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Horizontal	Horizontal	Yes
Arc down	Arc down	Yes
Arc up	Arc up	Yes

Part 2. Comparison of line stroke touch relations

Tián pictogram line stroke relations	Piedras Marcadas Canyon glyph line stroke relations	Shared Relation
Intersection - vertical & horizontal	Intersection - vertical & horizontal	Yes
Junction - vertical & arc down	Junction - vertical & arc down	Yes
Junction - vertical & arc up	Intersection - vertical & arc up	No
Junction - horizontal & arc connection point	Junction - horizontal & arc connection point	Yes
Junction - hoizontal & arc connection point	Junction - horizontal & arc connection point	Yes
Connection - arc down & arc up (left)	Connection - arc down & arc up (left)	Yes
Connection - arc down & arc up (right)	Connection - arc down & arc up (right)	Yes

Calculation of Jaccard's Index for the comparison of the Tián pictogram with the Piedras Marcadas petroglyph

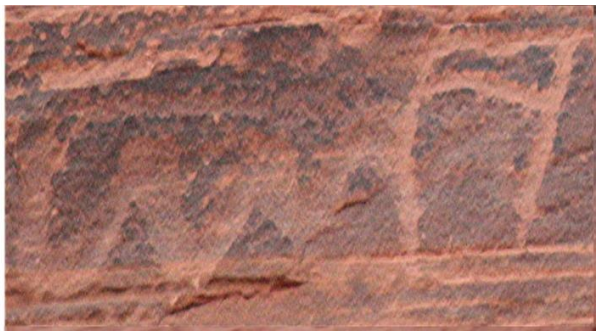
Total number of shared features M11 = 10
Total number of features N = 11
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{1 + 0 + 10} = \frac{10}{11} = 0.9091$$

For N = 11 and $J = 0.9091$; P = 0.001

Chart 23
Chinese Zhōu (boat) Pictogram vs. Valley of Fire Petroglyph

Oracle-bone Zhōu pictogram
Image: Bernhard Karlgren



Valley of Fire glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	**Valley of Fire glyph line strokes and analogous boat descriptors**	**Shared Feature**
Vertical left (hull + strake)	Vertical left (hull + strake)	Yes
Vertical right (hull + strake)	Vertical right (hull + strake)	Yes
Horizontal #1 (bow)	Horizontal #1 (bow)	Yes
Horistontal #2 (stern)	Horizontal #2 (stern)	Yes
None	Wavy line (water)	No

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	**Valley of Fire glyph line stroke relations**	**Shared Relation**
Parallel - vertical right & vertical left	Parallel - vertical right & vertical left	Yes
Junction - horizontal #1 & vertical left	Junction - horizontal #1 & vertical left	Yes
Junction - horizontal #1 & vertical right	Junction - horizontal #1 & vertical right	Yes
Junction - horizontal #2 & vertical left	Junction - horizontal #2 & vertical left	Yes
Junction - horizontal #2 & vertical right	Junction - horizontal #2 & vertical right	Yes
None	Connection - wavy line & vertical right	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Valley of Fire petroglyph

Total number of shared features M11 = 9
Total number of features N = 11
For Index of Similarity calculation: M10 = 0; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 2 + 9} = \frac{9}{11} = 0.8182$$

For N = 11 and $J = 0.8182$; $P < 0.01$

Chart 24
Chinese Wèi (large tree) Pictogram vs. Valley of Fire Petroglyph

Oracle-bone Wèi pictogram
Image: Richard Sears

Valley of Fire glyph

Part 1. Comparison of line strokes

Wèi pictogram line strokes and analogous tree descriptors	**Valley of Fire glyph line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Curve-up #1 (top left branch)	Curve-up #1 (top left branch)	Yes
Curve-up #2 (top right branch)	Curve-up #2 (top right branch)	Yes
None	Curve-up #3 (middle left branch)	No
None	Curve-up #4 (middle right branch)	No
Curve-up #3 (lower left branch)	Curve-up #5 (lower left branch)	Yes
Curve-up #4 (bottom right branch)	Curve-up #6 (lower right branch)	Yes
Horizontal #1 (left ground)	Diagonal up #1 (left top root)	No
Horiztontal #2 (right ground)	Diagonal down #1(right top root)	No
Diagonal Up (left root)	Diagonal up #2 (left bottom root)	Yes
Diagonal down (right root)	Diagonal down #2 (right bottom root)	Yes

Part 2. Comparison of line stroke touch relations

Wèi pictogram line stroke relations	**Valley of Fire glyph line stroke relations**	**Shared Relation**
Junction - curve-up #1 & vertical	Junction - curve-up #1 & vertical	Yes
Junction - curve-up #2 & vertical	Junction - curve-up #2 & vertical	Yes
None	Junction - curve-up #3 & vertical	No
None	Junction - curve-up #4 & vertical	No
Junction - curve-up #3 & vertical	Junction - curve-up #5 & vertical	Yes
Junction - curve-up #4 & vertical	Junction - curve-up #6 & vertical	Yes
Junction - horizontal #1 & vertical	Junction - diagonal up #1 & vertical	Yes
Junction - horizontal #2 & vertical	Junction - diagonal down #1 & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up #2 & vertical	Yes
Junction - diagonal down & vertical	Junction - diagonal down #2 & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Wèi pictogram with the Valley of Fire petroglyph

Total number of shared features M11 = 15
Total number of features N = 21
For Index of Similarity calculation: M10 = 2; M01 = 4

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{2 + 4 + 15} = \frac{15}{21} = 0.7143$$

For N = 21 and $J = 0.7143$; P = 0.001

Chart 25
Chinese Guǒ (fruit tree) Pictogram vs. Piedras Marcadas Canyon Petroglyph

Oracle-bone Guǒ pictogram
Image: Richard Sears

Piedras Marcadas Canyon glyph

Part 1. Comparison of line strokes

Guǒ Pictogram line strokes and analogous tree descriptors	**Piedras Marcadas Canyon glyph line strokes and analogous tree descriptors**	**Shared Relation**
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down #1(left branch)	Curve-up #1(left branch)	No
Curve-up (right branch)	Curve-up #2 (right branch)	Yes
Circle (fruit)	Circle (fruit)	Yes
Diagonal up (left root)	Diagonal up (left root)	Yes
Diagonal down #2 (right root)	Diagonal down (right root)	Yes

Part 2. Comparison of line stroke touch relations

Guǒ pictogram line stroke relations	**Piedras Marcadas Canyon glyph line stroke relations**	**Shared Relation**
Junction - diagonal down #1 & circle	Junction - curve-up #1 & circle	Yes
Junction - curve-up & vertical	Junction - curve-up #2 & circle	No
Connection - circle & vertical	Connection - circle & vertical	Yes
Junction - diagonal up & vertical	Junction - diagonal up & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Guǒ pictogram with the Piedras Marcadas petroglyph

Total number of shared features M11 = 9
Total number of features N = 11
For Index of Similarity calculation: M10 = 2; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{2 + 0 + 9} = \frac{9}{11} = 0.8182$$

For N = 11 and $J = 0.8182$; $P < 0.01$

Chart 26
Chinese Chǐ (teeth) Pictogram vs. Grapevine Canyon Petroglyph

Oracle-bone Chǐ pictogram
Image: Richard Sears

Grapevine Canyon glyph

Part 1. Comparison of line strokes

Chǐ pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
Vertical #1 (exterior left)	Vertical #1 (exterior left)	Yes
Vertical #2 (exterior right)	Vertical #2 (exterior right)	Yes
Horizontal #1 (exterior top)	Horizontal #1 (exterior top)	Yes
Horizontal #2 (exterior bottom)	Curve-up (exterior left bottom)	No
Vertical #3 (interior left top)	Vertical #3 (interior left top)	Yes
Vertical #4 (interior left center top)	Vertical #4 (interior left center top)	Yes
Vertical #5 (interior right center top)	Vertical #5 (interior right center top)	Yes
Vertical #6 (interior right top)	Vertical #6 (interior right top)	Yes
Horizontal #3 (interior left top)	Horizontal #2 (interior left top)	Yes
Horizontal #4 (interior right top)	Horizontal #3 (interior right top)	Yes
Vertical #7 (interior left bottom)	Vertical #7 (interior left bottom)	Yes
Vertical #8 (interior left center bottom)	Vertical #8 (interior left center bottom)	Yes
Vertical #9 (interior right center bottom)	Vertical #9 (interior right center bottom)	Yes
Vertical #10 (interior right bottom)	Vertical #10 (interior right bottom)	Yes
Horizontal #5 (interior left bottom)	Horizontal #4 (interior left bottom)	Yes
Horizontal #6 (interior right bottom)	Horizontal #5 (interior right bottom)	Yes
None	Vertical #11 (interior far left bottom)	No

Part 2. Comparison of line stroke touch relations

Chinese Chǐ pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	Yes
Connection - vertical #2 & horizontal #1	Connection - vertical #2 & horizontal #1	Yes
Connection - vertical #1 & horizontal #2	Connection - vertical #1 & curve-up	Yes
Connection - vertical #2 & horizontal #2	Connection - vertical #2 & curve-up	Yes

- Chart continued on the following page -

Chǐ pictogram line stroke relations	**Grapevine Canyon glyph line stroke relations**	**Shared Relation**
Junction - vertical #3 & horizontal #1	Junction - vertical #3 & horizontal #1	Yes
Connection - vertical #3 & horizontal #3	Connection - vertical #3 & horizontal #3	Yes
Junction - vertical #4 & horizontal #1	Junction - vertical #4 & horizontal #1	Yes
Connection - vertical #4 & horizontal #3	Connection - vertical #4 & horizontal #3	Yes
Junction - vertical #5 & horizontal #1	Junction - vertical #5 & horizontal #1	Yes
Connection - vertical #5 & horizontal #4	Connection - vertical #5 & horizontal #4	Yes
Junction - vertical #6 & horizontal #1	Junction - vertical #6 & horizontal #1	Yes
Connection - vertical #6 & horizontal #4	Connection - vertical #6 & horizontal #4	Yes
Junction - vertical #7 & horizontal #2	Junction - vertical #7 & curve-up #2	Yes
Connection - vertical #7& horizontal #5	Connection - vertical #7& horizontal #5	Yes
Junction - vertical #8 & horizontal #2	Junction - vertical #8 & curve-up	Yes
Connection - vertical #8 & horizontal #5	Connection - vertical #8 & horizontal #5	Yes
Junction - vertical #9 & horizontal #2	Junction - vertical #9 & curve-up	Yes
Connection - vertical #9 & horizontal #6	Connection - vertical #9 & horizontal #6	Yes
Junction - vertical #10 & horizontal #2	Junction - vertical #10 & curve-up	Yes
Connection - vertical #10 & horizontal #6	Connection - vertical #10 & horizontal #6	Yes
None	Junction - vertical #11 & curve-up	No

Calculation of Jaccard's Index for the comparison of the Chǐ pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 35
Total number of features N = 38
For Index of Similarity calculation: M10 = 1; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{35}{1 + 2 + 35} = \frac{35}{38} = 0.9211$$

For N = 38 and $J = 0.9211$; $P < 0.001$

Chart 27
Chinese Cì (thorn) Pictogram vs. St. Johns, Arizona Petroglyph

Seal era Cì pictogram
Image: Frank Chalfant

St. Johns glyph

Part 1. Comparison of line strokes

Cì pictogram line strokes with analogous thorn descriptors	St. Johns glyph line strokes with analogous thorn descriptors	Shared Feature
Vertical (central stem)	Vertical (central stem)	Yes
Horizontal (central branch)	Horizontal (central branch)	Yes
Curve-up #1 (left top branch)	Curve-up #1 (left top branch)	Yes
Curve-up #2 (right top branch)	Curve-up #2 (right top branch)	Yes
Diagonal up #1(left root)	Diagonal up #1 (left root)	Yes
Diagonal down #1(right root)	Diagonal down #1 (right root)	Yes
Diagonal up #2 (left thorn)	Diagonal up #2 (left thorn)	Yes
Diagonal down #2 (left thorn)	Diagonal down #2 (left thorn)	Yes
Diagonal up #3 (right thorn)	Diagonal up #3 (right thorn)	Yes
Diagonal down #3 (right thorn)	Diagonal down #3 (right thorn)	Yes

Part 2. Comparison of line stroke touch relations

Cì pictogram line stroke relations	St. Johns glyph line stroke relations	Shared Relation
Intersection - horizontal & vertical	Intersection - horizontal & vertical	Yes
Junction - curve-up #1 & vertical	Junction - curve-up #1 & vertical	Yes
Junction - curve-up #2 & vertical	Junction - curve-up #2 & vertical	Yes
Junction - diagonal up #1 & vertical	Junction - diagonal up #1 & vertical	Yes
Junction - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	Yes
Connection - diagonal up #2 & horizontal	Connection - diagonal up #2 & horizontal	Yes
Connection - diagonal down #2 & horizontal	Connection - diagonal down #2 & horizontal	Yes
Connection - diagonal up #3 & horizontal	Connection - diagonal up #3 & horizontal	Yes
Connection - diagonal down #3 & horizontal	Connection - diagonal down #3 & horizontal	Yes

Calculation of Jaccard's Index for the comparison of the Cì pictogram with the St. Johns, Arizona petroglyph

Total number of shared features M11 = 19
Total number of features N = 19
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{19}{0 + 0 + 19} = \frac{19}{19} = 1.0000$$

For N = 19 and $J = 1.0000$; $P < 0.001$

Chart 28
Chinese Wén (man) Pictogram vs. Jeffers Petroglyphs Historic Site Petroglyph

Oracle-bone Wén pictogram
Image: Richard Sears

Jeffers glyph

Part 1. Comparison of line strokes

Wén pictogram line strokes	Jeffers petroglyph line strokes	Shared Feature
Arc down	Arc down	Yes
Vertical	Vertical	Yes
Diagonal down	Diagonal down	Yes
Diagonal up	Diagonal up	Yes

Part 2. Comparison of line stroke touch relations

Wén pictogram line stroke relations	Jeffers petroglyph line stroke relations	Shared Relation
Junction - vertical & arc down	Junction - vertical & arc down	Yes
Junction - diagonal down & arc down	Junction - diagonal down & arc down	Yes
Junction - diagonal up & arc down	Junction - diagonal up & arc down	Yes
Intersection - diagonal up & diagonal down	Intersection - diagonal up & diagonal down	Yes

Calculation of Jaccard's Index for the comparison of the Wén pictogram with the Jeffers Petroglyphs Historic Site petroglyph

Total number of shared features M11 = 8
Total number of features N = 8
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{0 + 0 + 8} = \frac{8}{8} = 1.0000$$

For N = 8 and $J = 1.0000$; P = 0.001

Chart 29
Chinese Wén (man) Pictogram vs. Boca Negra Canyon Petroglyph

Oracle-bone Wén pictogram
Image: Richard Sears

Boca Negra Canyon glyph

Part 1. Comparison of line strokes

Wén pictogram line strokes	Boca Negra Canyon glyph line strokes	Shared Feature
Arc down (arms)	Arc down (arms)	Yes
Vertical (head)	Vertical - head	Yes
Diagonal down (body-leg)	Diagonal down (body-leg)	Yes
Diagonal up (body-leg)	Diagonal up (body-leg)	Yes
None	Horizontal	No

Part 2. Comparison of line stroke touch relations

Wén pictogram line stroke relations	Boca Negra Canyon glyph line stroke relations	Shared Relation
Junction - vertical & arc down	Junction - vertical & arc down	Yes
Junction - Diagonal down & arc down	Junction - diagonal down & arc down	Yes
Junction - diagonal up & arc down	Junction - diagonal up & arc down	Yes
Intersection - diagonal up & diagonal down	Intersection - diagonal up & diagonal down	Yes
None	Junction - diagonal down & horizontal	No
None	Junction - diagonal up & horizontal	No

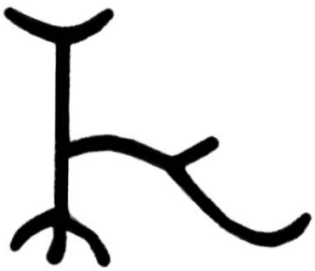
Calculation of Jaccard's Index for the comparison of the Wén pictogram with the Boca Negra Canyon petroglyph

Total number of shared features M11 = 8
Total number of features N = 11
For Index of Similarity calculation: M10 = 0; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{0 + 3 + 8} = \frac{8}{11} = 0.7273$$

For N = 11 and $J = 0.7273$; P = 0.01

Chart 30
Chinese Quăn (dog) Pictogram vs. Rinconada Canyon Petroglyph



Seal era Quăn pictogram
Image: Frank Chalfant

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Quăn pictogram line strokes and analogous zoomorph features	**Rinconada Canyon glyph line strokes and analogous zoomorph features**	**Shared Feature**
Arc up #1 (head)	Arc up (head)	Yes
Vertical (forebody)	Vertical #1 (forebody)	Yes
Diagonal up #1 (foreleg)	Diagonal up (foreleg)	Yes
Diagonal down (foreleg)	Diagonal down (foreleg)	Yes
Wavy line (body)	Wavy line (body)	Yes
Diagonal up #2 (tail)	Curve right (tail)	No
None	Inverted "T"	No
None	Vertical #2 (hindleg)	No

Part 2. Comparison of line stroke touch relations

Quăn pictogram line stroke relations	**Rinconada Canyon glyph line stroke relations**	**Shared Relation**
Junction - arc up #1 & vertical	Junction - arc up & vertical #1	Yes
Junction - diagonal up #1 & vertical	Junction - diagonal up & vertical #1	Yes
Junction - diagonal down & vertical	Junction - diagonal down & vertical #1	Yes
Junction - vertical & wavy line	Junction - vertical #1 & wavy line	Yes
Junction - diagonal up #2 & wavy line	Junction - curve right & wavy line	Yes
None	Junction - inverted "T" & wavy line	No
None	Junction - vertical #2 & wavy line	No

Calculation of Jaccard's Index for the comparison of the Quăn pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 10
Total number of features N = 15
For Index of Similarity calculation: M10 = 1; M01 = 4

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{1 + 4 + 10} = \frac{10}{15} = 0.6667$$

For N = 15 and $J = 0.6667$; P = 0.01

Chart 31
Chinese Huā (flower) Pictogram vs. Rinconada Canyon Petroglyph

Seal era Huā pictogram
Image: Frank Chalfant

Rinconada glyph

Part 1. Comparison of line strokes

Huā pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Arc down #1 (left top flower)	Arc down #1 (left top flower)	Yes
Arc down #2 (right top flower)	Arc down #2 (right top flower)	Yes
Arc down #3 (left bottom flower)	Arc down #3 (left bottom flower)	Yes
Arc down #4 (right bottom flower)	Arc down #4 (right bottom flower)	Yes
Diagonal up #1 (stem top)	Diagonal up #1 (stem top)	Yes
Dot #1 (left top flower)	Dot #1 (left top flower)	Yes
Dot #2 (right top flower)	Dot #2 (right top flower)	Yes
Dot #3 (left bottom flower)	Dot #3 (left bottom flower)	Yes
Dot #4 (right bottom flower)	Dot #4 (right bottom flower)	Yes
Vertical (stem)	Vertical (stem)	Yes
Diagonal up #2 (left top root)	Horizontal #1 (left top)	No
Diagonal down #1 (right top root)	Horizontal #2 (right top)	No
Diagonal up #3 (left bottom root)	Horizontal #3 (left bottom)	No
Diagonal down #2 (right bottom root)	Horizontal #4 (right bottom)	No

Part 2. Comparison of line stroke touch relations

Huā pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Junction - arc down #1 & vertical	Junction - arc down #1 & vertical	Yes
Junction - arc down #2 & vertical	Junction - arc down #2 & vertical	Yes
Junction - arc down #3 & vertical	Junction - arc down #3 & vertical	Yes
Junction - arc down #4 & vertical	Junction - arc down #4 & vertical	Yes
Connection - diagonal up #1 & vertical	Connection - diagonal up #1 & vertical	Yes
Placement - dot #1within arc down #1	Placement - dot #1 within arc down #1	Yes
Placement - dot #2 within arc down #2	Placement - dot #2 within arc down #2	Yes
Placement - dot #3 within arc down #3	Placement - dot #3 within arc down #3	Yes
Placement - dot #4 within arc down #4	Placement - dot #4 within arc down #4	Yes
Junction - diagonal up #2 & vertical	Junction - horizontal #1 & vertical	Yes
Junction - diagonal down #1 & vertical	Junction - horizontal #2 & vertical	Yes
Junction - diagonal up #3 & vertical	Connection - horizontal #3 & vertical	No
Junction - diagonal down #2 & vertical	Connection - horizontal #4 & vertical	No

- Chart continued on the following page -

Calculation of Jaccard's Index for the comparison of the Huā pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 21
Total number of features N = 27
For Index of Similarity calculation: M10 = 6; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{21}{6 + 0 + 21} = \frac{21}{27} = 0.7778$$

For N = 27 and $J = 0.7778$; $P < 0.001$

Chart 32
Chinese Zhōu (boat) Pictogram vs. Petrified Forest Petroglyph

Seal era Zhōu pictogram
Image: Richard Sears

Plain photograph

Photo with red trace lines

Petrified Forest glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous nautical features	Petrified Forest glyph line strokes and analogous nautical features	Shared Feature
Vertical #1 (left hull + strake)	Vertical #1 (left hull + strake)	Yes
Vertical #2 (right hull + strake)	Vertical #2 (right hull + strake)	Yes
Horizontal #1 (bow)	Horizontal #1 (bow)	Yes
Horizontal #2 (bow thwart)	Horizontal #2 (bow thwart)	Yes
Horizontal #3 (midship thwart)	Horizontal #3 (midship thwart)	Yes
Horizontal #4 (stern)	Horizontal #4 (stern)	Yes
Wavy line (water)	Wavy line (water)	Yes

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	Petrified Forest glyph line stroke relations	Shared Relation
Parallel - vertical #1 & vertical #2	Parallel - vertical #1 & vertical #2	Yes
None	Connection - horizontal #1 & vertical #1	No
Connection - horizontal #1& vertical #2	Connection - horizontal #1 & vertical #2	Yes
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
None	Junction - horizontal #2 & vertical #2	No
Junction - horizontal #3 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
Junction - horizontal #3 & vertical #2	Junction - horizontal #3 & vertical #2	Yes
Junction - horizontal #4 & vertical #1	Junction - horizontal #4 & vertical #1	Yes
None	Junction - horizontal #4 & vertical #2	No
Connection - wavy line & horizontal #1	Connection - wavy line & horizontal #1	Yes

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Petrified Forest petroglyph

Total number of shared features M11 = 14
Total number of features N = 17
For Index of Similarity calculation: M10 = 0; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{14}{0 + 3 + 14} = \frac{14}{17} = 0.8235$$

For N = 17 and $J = 0.8235$; $P < 0.001$

Chart 33
Chinese Shuĭ (water) Pictogram vs. Petrified Forest Petroglyph

Bronze era Shuĭ pictogram
Image: Frank Chalfant

Plain photograph

Photo with green trace lines

Petrified Forest Shuĭ glyph

Part 1. Comparison of line strokes

Shuĭ pictogram line strokes	**Petrified Forest pictograph line strokes**	**Shared Feature**
Diagonal set #1 (alternating down-up-down)	Diagonal set #1 (alternating down-up-down)	Yes(x3)
Diagonal set #2 (alternating down-up-down)	Diagonal set #2 (alternating down-up-down)	Yes(x3)
Diagonal set #3 (alternating down-up-down)	Diagonal set #3 (alternating down-up-down)	Yes(x3)

Part 2. Comparison of line stroke touch relations

Shuĭ pictogram line stroke relations	**Petrified Forest glyph line stroke relations**	**Shared Relation**
Connections - diagonal set #1 down-up-down	Connections - diagonal set #1down-up-down	Yes (x2)
Connections - diagonal set #2 down-up-down	Connections - diagonal set #2 down-up-down	Yes (x2)
Connections - diagonal set #3 down-up-down	Connections - diagonal set #3 down-up-down	Yes (x2)
Placement - diagonal set #1 in phase with … diagonal set #2	Placement - diagonal set #1 in phase with … diagonal set #2	Yes
Placement - diagonal set #2 in phase with … diagonal set #3	Placement - diagonal set #2 in phase with … diagonal set #3	Yes

Calculation of Jaccard's Index for the comparison of the Shuĭ pictogram with the Petrified Forest petroglyph

Total number of shared features M11 = 17
Total number of features N = 17
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{17}{0 + 0 + 17} = \frac{17}{17} = 1.0000$$

For N = 17 and $J = 1.0000$; $P < 0.001$

Chart 34
Chinese Mì (thread) Pictogram vs. Petrified Forest Petroglyph

Oracle-bone Mì pictogram
Image: Richard Sears

Petrified Forest glyph

Part 1. Comparison of llne strokes

Mì pictogram line strokes	Petrified Forest glyph line strokes	Shared Feature
Diagonal set #1 (down-up-down-up)	Diagonal set #1 (down-up-down-up)	Yes (x4)
Diagonal set #2 (up-down-up-down)	Diagonal set #2 (up-down-up-down)	Yes (x4)
None	Vertical #1 (center bottom)	No
None	Vertical #2 (left bottom)	No
None	Vertical #3 (right bottom)	No

Part 2. Comparison of line stroke touch relations

Mì pictogram line stroke relations	Petrified Forest glyph line stroke relations	Shared Relation
Connection - diagonal set #1 &… diagonal set #2	Connection - diagonal set #1 &… diagonal set #2	Yes
None	Connection - vertical #1 & diagonals	No
None	Connection - vertical #2 & vertical #1	No
None	Connection - vertical #3 & vertical #1	No
Intersection - diagonal set #1 & … diagonal set #2	Intersection - diagonal set #1 &… diagonal set #2	Yes (x3)

Calculation of Jaccard's Index for the comparison of the Mì pictogram with the Petrified Forest petroglyph

Total number of shared features M11 = 12
Total number of features N = 18
For Index of Similarity calculation: M10 = 0; M01 = 6

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{12}{0 + 6 + 12} = \frac{12}{18} = 0.6667$$

For N = 18 and $J = 0.6667$; P = 0.01

Chart 35
Chinese Xiàng (elephant) Pictogram vs. Petrified Forest Petroglyph

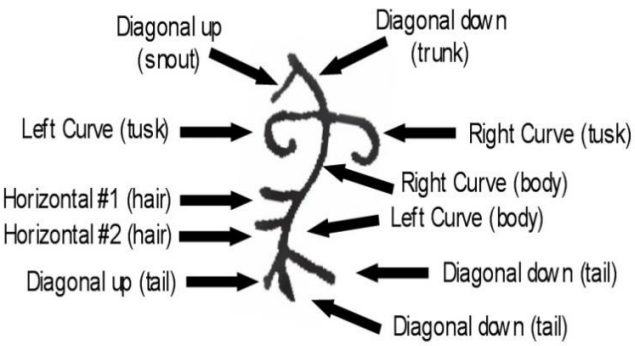
AD 100----------1300 BC

Evolution of the Chinese Xiàng pictogram

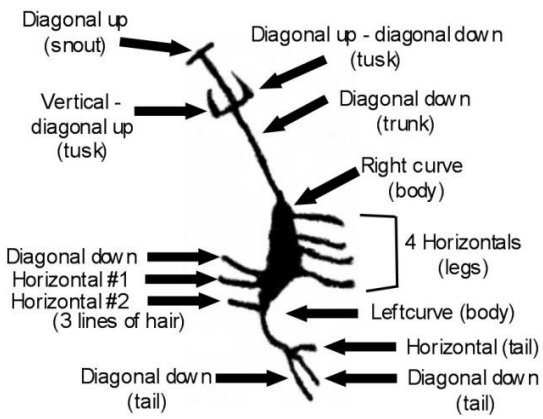
From: "Early Chinese Writing" by Frank Chalfant

Bronze era Xiàng pictogram

Petrified Forest petroglyph



Chinese bronze era Xiàng pictogram line strokes



Petrified Forest petroglyph line strokes

- Chart continued on the following page -

Petrified Forest petroglyph showing bifurcation at the end of the trunk

Part 1. Comparison of line strokes

Xiàng pictogram line strokes and analogous zoomorph descriptors	Petrified Forest glyph line strokes and analogous zoomorph descriptors	Shared Feature
Diagonal up #1 (tail left)	Diagonal down #1 (tail left)	No (Yes)
Diagonal down #1 (tail center)	Diagonal down #2 (tail center)	Yes
Diagonal down #2 (tail right)	Horizontal (tail right)	No (Yes)
Horizontal #1 (hair)	Horizontal left #1 (hair)	Yes
Horizontal #2 (hair)	Horizontal left #2 (hair)	Yes
None	Diagonal down #3 (hair)	No
Right curve #1 (forebody and head)	Right curve (forebody and head)	Yes
Left curve #1 (posterior body)	Left curve (posterior body)	Yes
Left curve #2 (left tusk)	Vertical / diagonal up (left tusk)	No
Right curve #2 (right tusk)	Diagonal up / diagonal down (right tusk)	No
Diagonal down #3 (trunk)	Diagonal down #4 (trunk)	Yes
Diagonal up #2 (bifurcated snout)	Diagonal up (bifurcated snout)	Yes
None	Horizontal right #1 (leg)	No (Omit)
None	Horizontal right #2 (leg)	No (Omit)
None	Horizontal right #3 (leg)	No (Omit)
None	Horizontal right #4 (leg)	No (Omit)

Part 2. Comparison of line stroke touch relations

Xiàng pictogram line stroke relations	Petrified Forest glyph line stroke relations	Shared Relation
Connection - diagonal up #1 & left curve #1	Connection - diagonal down #1 & left curve	Yes
Connection - diagonal down #1 & left curve #1	Connection - diagonal down #2 & left curve	Yes
Connection - diagonal down #2 & left curve #1	Connection - horizontal & left curve	Yes
Junction - horizontal #1 & left curve #1	Junction - horizontal left #1 & left curve	Yes
Junction - horizontal #2 & left curve #1	Junction - horizontal left #2 & left curve	Yes

- Chart continued on the following page -

Xiàng pictogram line stroke relations	Petrified Forest glyph line stroke relations	Shared Relation
None	Junction - diagonal down #3 & left curve	No
Junction - left curve #2 & diagonal down #3	Junction - vertical up / diagonal up & diagonal down #4	Yes
Junction - right curve #2& diagonal down #3	Junction - diagonal up / diagonal down & diagonal down #4	Yes
Junction - diagonal up #2 & diagonal down #3	Junction - diagonal up & diagonal down #4	Yes
None	Junction - horizontal right #1 & right curve (body)	No (Omit)
None	Junction - horizontal right #2 & right curve (body)	No (Omit)
None	Junction - horizontal right #3 & right curve (body)	No (Omit)
None	Junction - horizontal right #4 & right curve (body)	No (Omit)

Calculation of Jaccard's Index for the comparison of the Xiàng pictogram with the Petrified Forest petroglyph

Total number of shared features M11 = 15
Total number of features N = 29
For Index of Similarity calculation: M10 = 4; M01 = 10

$$\text{Jaccard Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{4 + 10 + 15} = \frac{15}{29} = 0.5172$$

For N = 29 and $J = 0.5172$; P = 0.05

Alternative calculation of Jaccard's Index without regard to the orientation of the trifid tail and omitting the four additional horizontal leg lines on the petroglyph

Note: Alternative values shown in parentheses alongside "Shared Relation" column.

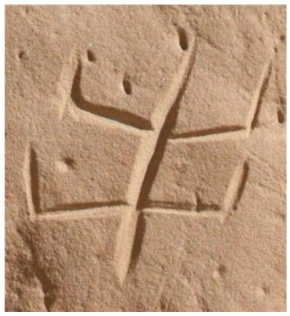
Total number of shared features M11 = 17
Total number of features N = 21
For Index of Similarity calculation: M10 = 2; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{17}{2 + 2 + 17} = \frac{17}{21} = 0.8095$$

For N = 21 and $J = 0.8095$; P < 0.001

Chart 36
Chinese Shŏu (hand) Pictogram vs. Chaco Canyon Petroglyph

Bronze era Shŏu pictogram
Image: Frank Chalfant



Chaco Canyon glyph

Part 1. Comparison of line strokes

Shŏu pictogram line strokes	Chaco Canyon glyph line strokes	Shared Feature
Left Curve (center line)	Left Curve (center line)	Yes
Vertical #1 (left top)	Diagonal up #1 (left top)	No
Vertical #2 (right top)	Diagonal up #2 (right top)	No
Vertical #3 (left bottom)	Vertical (left bottom)	Yes
Vertical #4 (right bottom)	Diagonal up #3 (right bottom)	No
Horizontal #1 (left top)	Diagonal down (left top)	No
Horizontal #2 (right top)	Horizontal #1(right top)	Yes
Horizontal #3 (left bottom)	Horizontal #2 (left bottom)	Yes
Horizontal #4 (right bottom)	Horizontal #3 (right bottom)	Yes

Part 2. Comparison of line stroke touch relations

Shŏu pictogram line stroke relations	Chaco Canyon line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - diagonal up #1 & diagonal down	Yes
Connection - vertical #2 & horizontal #2	Connection - diagonal up #2 & horizontal #1	Yes
Connection - vertical #3 & horizontal #3	Connection - vertical & horizontal #2	Yes
Connection - vertical #4 &horizontal #4	Connection - diagonal up #3 & horizontal #3	Yes
Connection - horizontal #1& left curve	Connection - diagonal down & left curve	Yes
Connection - horizontal #2 & left curve	Connection - horizontal #1 left curve	Yes
Connection - horizontal #3 & left curve	Connection - horizontal #2 & left curve	Yes
Connection - horizontal #4 & left curve	Connection - horizontal #3 & left curve	Yes

Calculation of Jaccard's Index for the comparison of the Shŏu pictogram with the Chaco Canyon petroglyph

Total number of shared features M11 = 13
Total number of features N = 17
For Index of Similarity calculation: M10 = 4; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{13}{4 + 0 + 13} = \frac{13}{17} = 0.7647$$

For N = 17 and $J = 0.7647$; P = 0.001

Chart 37
Chinese Quăn (dog) Pictogram vs. Grapevine Canyon Petroglyph

Oracle-bone Quăn pictogram
Image: Richard Sears

Grapevine Canyon glyph

Part 1. Comparison of line strokes

Quăn pictogram line strokes and analygous zoomorph features	**Grapevine Canyon glyph line strokes and analygous zoomorph features**	**Shared Feature**
Arc up (body)	Horizontal (body)	No
Arc down (tail)	Vertical #1 (tail)	No
Vertical #1 (hind leg)	Vertical #2 (hind leg)	Yes
Diagonal up #1 (hind foot)	Diagonal up #1 (hind foot)	Yes
Diagonal down #1 (hind foot)	Diagonal down #1 (hind foot)	Yes
Vertical #2 (front leg)	Vertical #3 (front leg)	Yes
Diagonal up #2 (forefoot)	Diagonal up #2 (forefoot)	Yes
Diagonal down #2 (forefoot)	Diagonal down #2 (forefoot)	Yes
None	Vertical #4 (neck)	No
Diagonal down #3 (ear & snout)	Diagonal down #3 (ear & snout)	Yes
Diagonal up #3 (ear)	Diagonal up #3 (ear)	Yes

Part 2. Comparison of line stroke touch relations

Quăn pictogram line stroke relations	**Grapevine Canyon glyph line stroke relations**	**Shared Relation**
Connection -arc up & arc down	Connection - horizontal & vertical #1	Yes
Connection -vertical #1 & arc up	Connection - vertical #2 & horizontal	Yes
Junction - diagonal up #1 & vertical #1	Junction - diagonal up #1 & vertical #2	Yes
Junction - diagonal down #1 & vertical #1	Junction - diagonal down #1 & vertical #2	Yes
Connection -vertical #2 & arc up	Connection - vertical #3 & horizontal	Yes
Junction - diagonal up #2 & vertical #2	Junction - diagonal up #2 & vertical #3	Yes
Junction - diagonal down #2 & vertical #2	Junction - diagonal down #2 & vertical #3	Yes
None	Connection - vertical #4 & horizontal	No
Connection - diagonal down #3 & arc up	Connection - diagonal down #3 & vertical #4	No
Junction - diagonal up #3 & arc up	Junction - diagonal up #3 & vertical #4	No

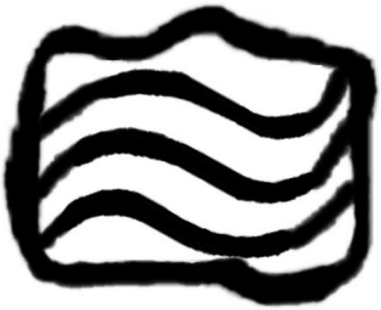
Calculation of Jaccard's Index for the comparison of the Quăn pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 15
Total number of features N = 21
For Index of Similarity calculation: M10 = 4; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{4 + 2 + 15} = \frac{15}{21} = 0.7143$$

For N = 21 and $J = 0.7143$; P = 0.001

Chart 38
Chinese Yuān (pond) Pictogram vs. Grapevine Canyon Petroglyph



Oracle-bone Yuān pictogram
Image: Richard Sears

Grapevine Canyon glyph

Part 1. Comparison of line strokes

Yuān pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
Wavy line #1 (top)	Wavy line #1 (top)	Yes
Wavy line #2 (middle)	Wavy line #2 (middle)	Yes
Wavy line #3 (bottom)	Wavy line #3 (bottom)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Vertical #1 (left)	Vertical #1 (top)	Yes
Vertical #2 (right)	Vertical #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Yuān pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
Connection - horizontal #1 & vertical #1	Connection - horizontal #1 & vertical #1	Yes
Connection - horizontal #1 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - horizontal #2 & vertical #1	Connection - horizontal #2 & vertical #1	Yes
Connection - horizontal #2 & vertical #2	Connection - horizontal #2 & vertical #2	Yes
Placement - wavy line #1 & in phase… with wavy line #2	Placement - wavy line #1 & in phase… with wavy line #2	Yes
Placement - wavy line #2 & in phase… with wavy line #3	Parallel - wavy line #2 & in phase… with wavy line #3	Yes
Placement - wavy lines within cartouche	Placement - wavy lines within cartouche	Yes

Calculation of Jaccard's Index for the comparison of the Yuān pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 14
Total number of features N = 14
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{14}{0 + 0 + 14} = \frac{14}{14} = 1.0000$$

For N = 14 and $J = 1.0000$; $P < 0.001$

Chart 39
Chinese Huā (flower) Pictogram vs. Little Colorado River Pictograph

Seal era Huā pictogram
Image: Frank Chalfant

Little Colorado River pictograph
(enhanced image)

Part 1. Comparison of line strokes

Huā pictogram line strokes	Little Colorado River pictograph line strokes	Shared Feature
Arc right (stem)	Arc right (stem)	Yes
Diagonal up #1 (left top)	Diagonal up #1 (left top)	Yes
Diagonal down #1 (left top)	Diagonal down #1 (left top)	Yes
Diagonal up #2 (right top)	Diagonal up #2 (right top)	Yes
Diagonal down #2 (right top)	Diagonal down #2 (right top)	Yes
Diagonal up #3 (left middle)	Diagonal up #3 (left middle)	Yes
Diagonal down #3 (right middle)	Diagonal up #4 (right middle)	No
None	Diagonal down #3 (right middle)	No
Horizontal #1	Horizontal	Yes
None	Vertical #1 (at left end of horizontal)	No
None	Vertical #2 (at right end of horizontal)	No
Horizontal #2	Diagonal up	No

Part 2. Comparison of line stroke touch relations

Huā pictogram line stroke relations	Little Colorado River line stroke relations	Shared Relation
Connection - diagonal up #1 & diagonal down #1	Connection - diagonal up #1 & diagonal down #1	Yes
Junction - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	Yes
Connection - diagonal up #2 & diagonal down #2	Connection - diagonal up #2 & diagonal down #2	Yes
Junction - diagonal up #2 & vertical	Junction - diagonal up #2 & vertical	Yes
Junction - diagonal up #3 & vertical	Junction - diagonal up #3 & vertical	Yes
Junction - diagonal down #3 & vertical	Junction - diagonal up #4 & vertical	Yes
None	Connection - diagonal up #4 & diagonal down #3	No
Intersection - horizontal #1 & vertical	Intersection - horizontal & vertical	Yes
None	Connection - vertical #1& horizontal	No
None	Connection - vertical #2 & horizontal	No
Intersection - horizontal #2 & vertical	Intersection - diagonal up & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Huā pictogram with the Little Colorado River pictograph

Total number of shared features M11 = 15
Total number of features N = 23
For Index of Similarity calculation: M10 = 2; M01 = 6

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{2 + 6 + 15} = \frac{15}{23} = 0.6522$$

For N = 23 and $J = 0.6522$; $P < 0.01$

Chart 40
Chinese Mì (thread) Pictogram vs. Little Colorado River Petroglyph

Oracle-bone Mì pictogram
Image: Richard Sears

Little Colorado River glyph

Part 1. Comparison of line strokes

Mì pictogram line strokes	Little Colorado River glyph line strokes	Shared Feature
Diagonal set #1 (down-up-down-up)	Diagonal set #1 (down-up-down-up-down)	Yes (x4)
Diagonal set #2 (up-down-up-down)	Diagonal set #2 (up-down-up-down-up)	Yes (x4)
Vertical #1 (center top)	None	No
Diagonal down #1 (top)	None	No
Diagonal up #1(top)	None	No
Vertical #2 (center bottom)	Vertical (center bottom)	Yes
Diagonal up #2 (bottom)	Diagonal up (bottom)	Yes
Diagonal down #2 (bottom)	Diagonal down (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Mì pictogram line stroke relations	Little Colorado River line stroke relations	Shared Relation
Connection - diagonal set #1	Connection -diagonal set #1	Yes (x3)
Connection - diagonal set #2	Connection - diagonal set #2	Yes (x3)
Connection - vertical #1 & diagonals	None	No
Connection - diagonal up #1 & diagonals	None	No
Connection - diagonal up #1 & diagonals	None	No
Connection - vertical #2 & diagonals	Connection - vertical & diagonals	Yes
Connection - diagonal up #2 & diagonals	Connection - diagonal up & diagonals	Yes
Connection - diagonal down #2 & diagonals	Connection - diagonal down & diagonals	Yes
Intersection - sequentially linked diagonals	Intersection - sequentially linked diagonals	Yes (x2)

Calculation of Jaccard's Index for the comparison of the Mì pictogram with the Little Colorado River petroglyph

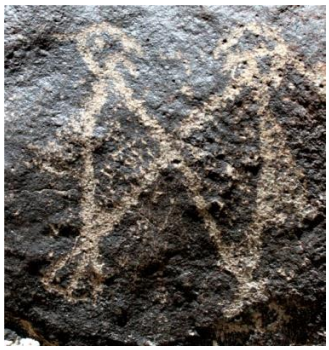
Total number of shared features M11 = 22
Total number of features N = 28
For Index of Similarity calculation: M10 = 0; M01 = 6

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{22}{0 + 6 + 22} = \frac{22}{28} = 0.7857$$

For N = 28 and $J = 0.7857$; $P < 0.001$

Chart 41
Chinese Péng (friend) Pictogram vs. Boca Negra Petroglyph

Oracle-bone Péng pictogram
Image: Adapted from Qiu Xigui



Boca Negra glyph

Part 1. Comparison of line strokes

Péng pictogram line strokes (left figure only listed below)	**Boca Negra glyph line strokes (left figure only listed below)**	**Shared Feature**
Vertical (back)	Vertical (back)	Yes
Diagonal up #1 (tail)	Diagonal up #1 (tail)	Yes
Diagonal down #1 (tail)	Diagonal down #1 (tail)	Yes
None	Horizontal #1 (tail)	No
Left curve (head)	Left curve (head)	Yes
Diagonal up #2 (beak)	Diagonal down #2 (beak)	No
Dot (eye)	Dot (eye)	Yes
Diagonal down #2 (breast)	Diagonal down #3 (breast	Yes
Diagonal up #3 (breast)	Diagonal up #2 (breast)	Yes
Horizontal #1 (wing)	Diagonal up #3 (wing)	No
Horizontal #2 (wing)	Horizontal #2 (wing)	Yes
Horizontal #3 (wing)	None	No

Part 2. Comparison of line stroke touch relations

Péng pictogram line stroke relations (left figure only)	**Boca Negra line stroke relations (left figure only)**	**Shared Relation**
Connection - vertical & diagonal up #2	Connection - vertical & diagonal down #2	Yes
Connection - left curve (top) & vertical	Connection - left curve (top) & vertical	Yes
Junction - left curve (bottom) & vertical	Junction - left curve (bottom) & vertical	Yes
Placement - dot within arc left	Placement - dot within arc left	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down #3 & vertical	Yes
Connection - diagonal down #2 & diagonal up #3	Connection - diagonal down #3 & diagonal up #2	Yes
Junction - diagonal up #3 & vertical	Junction - diagonal up #2 & vertical	Yes
None	Connection - horizontal #1 & diagonal up #1	No
None	Connection - horizontal #1 & diagonal down #1	No
None	Junction - horizontal #1 & vertical	No
Junction - horizontal #1 & vertical	Junction - diagonal up #3 & vertical	Yes
Junction - horizontal #2 & vertical	Junction - horizontal #2 & vertical	Yes
None	Connection - diagonal up #3 & horizontal #2	No
Junction - horizontal #3 & vertical	None	No
Junction - diagonal up #1 & vertical	Junction - diagonal up #1 & vertical	Yes
Junction - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	Yes

- Chart continued on the following page -

Calculation of Jaccard's Index for the comparison of the Péng pictogram with the Boca Negra petroglyph

Note: Numerical values for the line strokes and touch relations are doubled in this formula to account for the mirror imagery of the Chinese pictogram and the Boca Negra petroglyph.

Total number of shared features M11 = 38
Total number of features N = 56
For Index of Similarity calculation: M10 = 8; M01 = 10

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{38}{8 + 10 + 38} = \frac{38}{56} = 0.6786$$

For N = 56 and $J = 0.6786$; $P < 0.001$

Chart 42
Chinese Péng (friend) Pictogram vs. Rinconada Canyon Petroglyph #1

Oracle-bone Péng pictogram
Image: Adapted from Qiu Xigui

Rinconada Canyon glyph #1

Part 1. Comparison of line strokes

Péng pictogram line strokes	Rinconada Canyon glyph #1 line strokes	Shared Feature
Bird profile # 1	Bird profile # 1	Yes
Bird profile #2	Bird profile #2	Yes
Wing feathers (profile #1)	Wing feathers (profile #1)	Yes
Wing feathers (profile #2)	Wing feathers (profile #2)	Yes

Part 2. Comparison of line stroke touch relations

Péng pictogram line stroke relations	Rinconada Canyon glyph #1 line stroke relations	Shared Relation
Placement -bird profile #1 facing right	Placement - bird profile #1 facing right	Yes
Placement - bird profile #2 facing left	Placement - bird profile #2 facing left	Yes
Connection - birds at breast	Connection - birds at breast	Yes
Connection - feathers & profile #1	Connection - feathers & profile #1	Yes
Connection - feathers & profile #2	Connection - feathers & profile #2	Yes

Calculation of Jaccard's Index for the comparison of the Péng pictogram with Rinconada Canyon petroglyph #1

Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 43
Chinese Péng (friend) Pictogram vs. Rinconada Canyon Petroglyph #2

Oracle-bone Péng pictogram
Image: Adapted from Qiu Xigui

Rinconada Canyon glyph #2

Part 1. Comparison of line strokes

Péng pictogram line strokes	**Rinconada Canyon glyph # 2 line strokes**	**Shared Feature**
Bird profile # 1	Bird profile # 1	Yes
Bird profile #2	Bird profile #2	Yes
Wing feathers (profile #1)	Wing feathers (profile #1)	Yes
Wing feathers (profile #2)	Wing feathers (profile #2)	Yes

Part 2. Comparison of line stroke touch relations

Péng pictogram line stroke relations	**Rinconada Canyon glyph #2 line stroke relations**	**Shared Relation**
Placement - **b**ird profile #1 facing right	Placement - bird profile #1 facing right	Yes
Placement - bird profile #2 facing left	Placement - bird profile #2 facing left	Yes
Connection - birds at breast	Connection - birds at breast	Yes
Connection - feathers & profile #1	Connection - feathers & profile #1	Yes
Connection - feathers & profile #2	Connection - feathers & profile #2	Yes

Calculation of Jaccard's Index for the comparison of the Péng pictogram with Rinconada Canyon petroglyph #2

Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 44
Chinese Wén (man) Pictogram vs. Coal Canyon Petroglyph

Oracle-bone Wén pictogram
Image: Richard Sears

Coal Canyon glyph

Part 1. Comparison of line strokes

Wén pictogram line strokes	Coal Canyon glyph line strokes	Shared Feature
Curve-up	Curve-up	Yes
Vertical (head)	Vertical (head)	Yes
Diagonal down	Diagonal down	Yes
Diagonal up	Diagonal up	Yes
None	Left hand	No
None	Right hand	No

Part 2. Comparison of line stroke touch relations

Wén pictogram line stroke relations	Coal Canyon glyph line stroke relations	Shared Relation
Junction - vertical & curve-up	Junction - vertical & curve-up	Yes
Junction - diagonal down & curve-up	Junction - diagonal down & curve-up	Yes
Junction - diagonal up & curve-up	Junction - diagonal up & curve-up	Yes
Intersection - diagonal up & diagonal down	Intersection - diagonal up & diagonal down	Yes
None	Connection - curve-up & left hand	No
None	Connection - curve-up & right hand	No

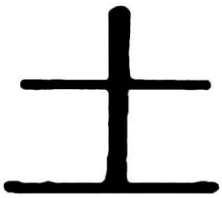
Calculation of Jaccard's Index for the comparison of the Wén pictogram with the Coal Canyon petroglyph

Total number of shared features M11 = 8
Total number of features N = 12
For Index of Similarity calculation: M10 = 0; M01 = 4

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{0 + 4 + 8} = \frac{8}{12} = 0.6667$$

For N = 12 and $J = 0.6667$; P = 0.05

Chart 45
Chinese Tǔ (ground) Pictogram vs. Rinconada Canyon Petroglyph



Seal era Tǔ pictogram
Image: Frank Chalfant

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Tǔ pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Horizontal #1 (crossbar)	Horizontal #1 (crossbar)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Tǔ pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Intersection - vertical & horizontal #1	Intersection - vertical & horizontal #1	Yes
Junction - vertical & horizontal #2	Junction - vertical & horizontal #2	Yes

Calculation of Jaccard's Index for the comparison of the Tǔ pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 5
Total number of features N = 5
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{0 + 0 + 5} = \frac{5}{5} = 1.0000$$

For N = 5 and $J = 1.0000$; P = 0.01

Chart 46
Chinese Jí (auspicious) Pictogram vs. Rinconada Canyon Petroglyph

Oracle-bone Jí pictogram
Image: Frank Chalfant

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Jí pictogram line strokes	**Rinconada Canyon glyph line strokes**	**Shared Feature**
Vertical	Vertical	Yes
Horizontal #1 (crossbar)	Horizontal #1 (crossbar)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Arc up	Arc up	Yes

Part 2. Comparison of line stroke touch relations

Jí pictogram line stroke relations	**Rinconada Canyon glyph line stroke relations**	**Shared Relation**
Intersection - vertical & horizontal #1	Intersection - vertical & horizontal #1	Yes
Junction - vertical & horizontal #2	Junction - vertical & horizontal #2	Yes
Junction - arc up & horizontal #2 (left)	Connection - arc up & horizontal #2 (left)	No
Junction - arc up & horizontal #2 (right)	Connection - arc up & horizontal #2 (right)	No

Calculation of Jaccard's Index for the comparison of the Jí pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 6
Total number of features N = 8
For Index of Similarity calculation: M10 = 2; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{6}{2 + 0 + 6} = \frac{6}{8} = 0.7500$$

For N = 8 and $J = 0.7500$; P = 0.05

Chart 47
Chinese Dà Jiă (5th Shang Dynasty King) vs. Rinconada Canyon Petroglyph

Oracle-bone Dà Jiă

Rinconada Canyon glyph

Images: Adapted from Richard Sears

Part 1. Comparison of line strokes

Dà Jiă pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Horizontal	Horizontal	Yes
Stickman	Stickman	Yes

Part 2. Comparison of line stroke touch relations

Dà Jiă pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Intersection - vertical & horizontal	Intersection - vertical & horizontal	Yes
Placement - stickman (Dà) adjoining Jiă	Placement - stickman (Dà) connection Jiă	No

Calculation of Jaccard's Index for the comparison of the Dà Jiă pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 4
Total number of features N = 5
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{4}{1 + 0 + 4} = \frac{4}{5} = 0.8000$$

For N = 5 and $J = 0.8000$; P = 0.05

Chart 48
Chinese Gào (sacrifice) Pictogram vs. Piedras Marcadas Petroglyph

Bronze era Gào pictogram
Image: Richard Sears

Piedras Marcadas glyph

Part 1. Comparison of line strokes

Gào pictogram line strokes	Piedras Marcadas glyph line strokes	Shared Feature
Vertical #1 (left top)	Vertical #1 (left top)	Yes
Vertical #2 (center top)	Vertical #2 (center top)	Yes
Vertical #3 (right top)	Vertical #3 (right top)	Yes
Vertical #4 (center)	Vertical #4 (center)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (middle)	Horizontal #2 (middle)	Yes
Arc up	Arc down	No
Horizontal #3 (bottom)	Horizontal #3 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Gào pictogram line stroke relations	Piedras Marcadas glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	Yes
Junction - vertical #2 & horizontal #1	Junction - vertical #2 & horizontal #1	Yes
Connection - vertical #3 & horizontal #1	Connection - vertical #3 & horizontal #1	Yes
Junction - vertical #4 & horizontal #1	None	No
Intersection - vertical #4 & horizontal #2	Intersection - vertical #4 & horizontal #2	Yes
Junction - vertical #4 & horizontal #3	Junction - vertical #4 & curve-up	No
Connection - horizontal #3 & arc up (left)	Connection - horizontal #3 & arc down (left)	Yes
Connection - horizontal #3 & arc up (right)	Connection - horizontal #3 & arc down (right)	Yes

Calculation of Jaccard's Index for the comparison of the Gào pictogram with the Piedras Marcadas petroglyph

Total number of shared features M11 = 13
Total number of features N = 16
For Index of Similarity calculation: M10 = 3; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{13}{3 + 0 + 13} = \frac{13}{16} = 0.8125$$

For N = 16 and $J = 0.8125$; $P < 0.001$

Chart 49
Chinese Wŭ (five) Pictogram vs. Piedras Marcadas Petroglyph

Bronze era Wŭ pictogram
Image: Frank Chalfant

Piedras Marcadas glyph

Part 1. Comparison of line strokes

Wŭ pictogram line strokes	Piedras Marcadas glyph line strokes	Shared Feature
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Diagonal up	Diagonal up	Yes
Diagonal down	Diagonal down	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Wŭ pictogram line stroke relations	Piedras Marcadas glyph line stroke relations	Shared Relation
Connection - horizontal #1 & diagonal down	Connection - horizontal #1 & diagonal down	Yes
Connection - horizontal #1 & diagonal up	Connection - horizontal #1 & diagonal up	Yes
Connection - horizontal #2 & diagonal up	Connection - horizontal #2 & diagonal up	Yes
Connection - horizontal #2 & diagonal down	Connection - horizontal #2 & diagonal down	Yes
Intersection - diagonal up & diagonal down	Intersection - diagonal up & diagonal down	Yes

Calculation of Jaccard's Index for the comparison of the Wŭ pictogram with the Piedras Marcadas petroglyph

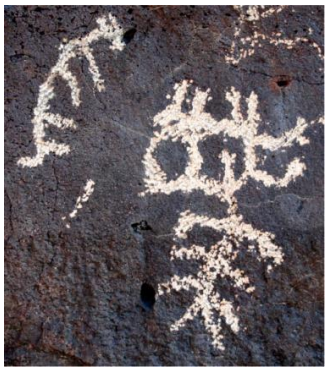
Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 50
Chinese Xiàn (to offer) Pictogram vs. Rinconada Canyon Petroglyph

Bronze era Xiàn pictogram
Image: Adapted from Richard Sears



Rinconada Canyon glyph

Part 1. Comparison of line strokes

Xiàn pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Dog pictogram	Dog pictogram	Yes
Head of tiger pictogram	Head of tiger pictogram	Yes
Cauldron pictogram	Cauldron pictogram	Yes

Part 2. Comparison of line stroke touch relations

Xiàn pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Placement - dog pictogram on the left side	Placement - dog pictogram on the left side	Yes
Placement - dog faces right	Placement - dog faces right	Yes
Placement - tiger head set atop cauldron	Placement - tiger head set atop cauldron	Yes
Placement - tiger head faces right	Placement - tiger head faces right	Yes

Calculation of Jaccard's Index for the comparison of the Xiàn pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 7
Total number of features N = 7
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{0 + 0 + 7} = \frac{7}{7} = 1.0000$$

For N = 7 and $J = 1.0000$; P = 0.001

Chart 51
Chinese Gēng (7th Heavenly Stem) Pictogram vs. Rinconada Canyon Petroglyph

Oracle-bone Gēng pictogram
Image: Frank Chalfant

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Gēng pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Vertical #1 (center)	Vertical #1 (center)	Yes
Vertical #2 (left)	Vertical #2 (left)	Yes
Vertical #3 (right)	Vertical #3 (right)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Diagonal down (top)	Curve left (top)	No
Diagonal up (top)	Curve right (top)	No

Part 2. Comparison of line stroke touch relations

Gēng pictogram line stroke relations	Rinconada Canyon line stroke relations	Shared Relation
Junction - vertical #1 & horizontal #1	Intersection - vertical #1 & horizontal #1	No
Intersection - vertical #1 & horizontal #2	Intersection - vertical #1 & horizontal #2	Yes
Connection - horizontal #1 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - horizontal #1 & vertical #3	Connection - horizontal #1 & vertical #3	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #2 & vertical #3	Junction - horizontal #2 & vertical #3	Yes
Intersection - diagonal down & horizontal #1	Connection - curve left & vertical #1	No
Intersection - diagonal up & horizontal #1	Connection - curve right & vertical #1	No

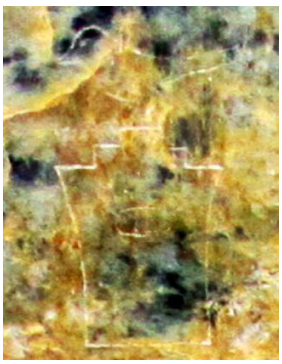
Calculation of Jaccard's Index for the comparison of the Gēng pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 10
Total number of features N = 15
For Index of Similarity calculation: M10 = 5; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{5 + 0 + 10} = \frac{10}{15} = 0.6667$$

For N = 15 and $J = 0.6667$; P = 0.01

Chart 52
Chinese Liángzhǔ Emblem vs. Rinconada Canyon Petroglyph



Liángzhǔ Emblem
Image: Shanghai Museum

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Liángzhǔ Emblem line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Vertical #1 (left top)	Vertical #1 (left top)	Yes
Vertical #2 (right top)	Vertical #2 (right top)	Yes
Horizontal #2 (left middle)	Horizontal #2 (left middle)	Yes
Horizontal #3 (right middle)	Horizontal #3 (right middle)	Yes
Vertical #3 (left middle)	Vertical #3 (left bottom)	Yes
Vertical #4 (right middle)	Vertical #4 (right bottom)	Yes
Horizontal #4 (left bottom)	None	No
Horizontal #5 (right bottom)	None	No
Right curve (left bottom)	None	No
Left curve (right bottom)	None	No
Horizontal #6 (bottom)	Horizontal #4 (bottom)	Yes
Vertical bird leg	Vertical bird leg	Yes
Bird profile	Bird profile	Yes
Central oval	None	No

Part 2. Comparison of line stroke touch relations

Liángzhǔ Emblem line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Connection - horizontal #1 & vertical #1	Connection - horizontal #1& vertical #1	Yes
Connection - horizontal #1 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - vertical #1 & horizontal #2	Connection - vertical #1 & horizontal #2	Yes
Connection - vertical #2 & horizontal #3	Connection - vertical #2 & horizontal #3	Yes
Connection - horizontal #2 & vertical #3	Connection - horizontal #2 & vertical #3	Yes
Connection - horizontal #3 & vertical #4	Connection - horizontal #2 & vertical #3	Yes
Connection - vertical #3 & horizontal #4	None	No
Connection - vertical #4 & horizontal #5	None	No
Connection - horizontal #4 & right curve	None	No
Connection - horizontal #5 & left curve	None	No
Connection - right curve & horizontal #6	None	No
Connection - left curve & horizontal #6	None	No
Junction - vertical bird leg & horizontal #1	Junction - vertical bird leg & horizontal #1	Yes
Junction - vertical bird leg & bottom… of bird profile	Junction - vertical bird leg & bottom of bird profile	Yes
Placement - bird facing left	Placement - bird facing left	Yes
Placement - oval within outline	None	No

- Chart continued on the following page -

Calculation of Jaccard's Index for the comparison of the Liángzhǔ Emblem with the Rinconada Canyon petroglyph

Total number of shared features M11 = 19
Total number of features N = 31
For Index of Similarity calculation: M10 = 12; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{19}{12 + 0 + 19} = \frac{19}{31} = 0.6129$$

For N = 31 and $J = 0.6129$; $P < 0.01$

Chart 53
Chinese Xún (10-day period) Pictogram vs. Rinconada Canyon Petroglyph

Oracle-bone Xún Pictogram
Image: Richard Sears

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Xún pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Circle (open at top right)	Circle (open at top right)	Yes
Diagnonal down	Diagonal down	Yes
Diagonal up	Diagonal up	Yes

Part 2. Comparison of line stroke touch relations

Xún pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Junction - diagonal down & circle	Junction - diagonal down & circle	Yes
Junction - diagonal up & circle	Junction - diagonal up & circle	Yes

Calculation of Jaccard's Index for the comparison of the Xún pictogram with the Rinconada Canyon petroglyph

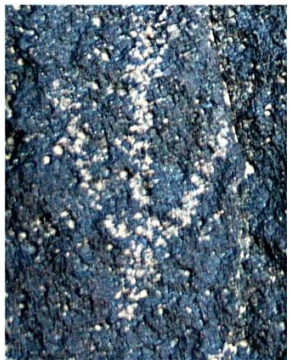
Total number of shared features M11 = 5
Total number of features N = 5
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{0 + 0 + 5} = \frac{5}{5} = 1.0000$$

For N = 5 and $J = 1.0000$; P = 0.01

Chart 54
Chinese Chè (plant) Pictogram vs. Piedras Marcadas glyph

Bronze era Chè pictogram
Image: Richard Sears



Piedras Marcadas glyph

Part 1. Comparison of line strokes

Chè pictogram line strokes	Piedras Marcadas glyph line strokes	Shared Feature
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down (left branch)	Diagonal down (left branch)	Yes
Diagonal up (right branch)	Diagonal up (right branch)	Yes

Part 2. Comparison of line stroke touch relations

Chè pictogram line stroke relations	Piedras Marcadas glyph line stroke relations	Shared Relation
Junction – diagonal down & vertical	Junction - diagonal down & vertical	Yes
Junction – diagonal up & vertical	Junction - diagonal up & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Chè pictogram with the Piedras Marcadas petroglyph

Total number of shared features M11 = 5
Total number of features N = 5
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{0 + 0 + 5} = \frac{5}{5} = 1.000$$

For N = 5 and $J = 1.0000$; P = 0.01

Appendix B

Independent Estimates for the Age of the Study Sites

Chart	Petroglyph	Location	Oldest Date	Most Common Date	Recent Date	Source Document	Author
1	Zhōu	El Morro	AD 1000	---	AD 1300	El Morro - Monitoring and Preservation	National Park Service
2	Zhōu	Lagomarsino	3000 BC	---	AD 1400	Lagomarsino Petroglyph Canyon Site	Nevada rock art foundation
3	Zhōu	Piedras Marcadas Canyon	AD 500	AD 1300-1680	AD 1680	Petroglyph National Monument "What are Petroglyphs?"	National Park Service
4	Zhōu	Kachina Bridge	AD 1	AD 700-1250	---	Guide to rock Art of the Utah Region	Dennis Slifer
4	Zhōu	Kachina Bridge	AD 200	AD 500-700	AD 1270	Cultural Affiliation of Kachina Bridge Ruin	Nancy Coulam
5	Zhōu	Lyman Lake	6000 BC - AD 300	AD 300 - 700	AD 1400	Interpreting the Prehistory of Lyman Lake State Park	Lyman Lake State Park
6	Zhōu	Arlington, Arizona	AD 350- 550	AD 750-950	AD 900-1400	Kiva, Vol. 66, No 2, 2000	Alexa M. Smith
7	Zhōu	Little Lake	6000 BC	AD 500	AD 1400	Little Lake Ranch - Geology, Archaeology, and Rock Art	Maturango Museum
8	Zhōu	Little Colorado River	6000 BC - AD 300	AD 300 - 700	AD 1400	Interpreting the Prehistory of Lyman Lake State Park	Lyman Lake State Park
9	Zhōu	Petroglyphs Provincial Park	AD 900	---	AD 1400	Petroglyphs Provincial Park Master Plan	Ontario Ministry of Natural Resources
10	Zhōu	Anasazi Ridge	AD 400	---	AD 1000	Petroglyphs US	Don Austin
11	Zhōu	Nine Mile Canyon	---	AD 750-1250	---	Fremont Panel Northern San Rafael Style	Diana Orr
11	Zhōu	Nine Mile Canyon	AD 300	AD 750	AD 1250	Nine Mile Canyon, Guide and Information	Climb-Utah.com
12	Shuĭ	Anza Borrego	---	AD1000-1800	---	Little Blair Valley pictographs	Petroglyphs.US
12	Shuĭ	Anza Borrego	AD 1- 1200	---	AD 1500	Anza-Borrego State Park	Desert USA
13	Yuān	Little Lake	6000 BC	AD 500	AD 1400	Little Lake Ranch - Geology, Archaeology, and Rock Art	Maturango Museum
14	Mù	Oracle-bone	---	1300 BC	---	The Oriental Institute	Staff
15	Mù	Red Canyon	---	AD 1100	---	A Guide to Rock Art Sites - Southern California and Southern Nevada	David Whitley
16	Mù	Red Canyon	---	AD 1100	---	A Guide to Rock Art Sites - Southern California and Southern Nevada	David Whitley

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Independent Estimates for the Age of the Study Sites

- Continued -

Chart	Petroglyph	Location	Oldest Date	Most Common Date	Recent Date	Source Document	Author
17	Mù	Chaco Canyon	---	AD 850-1250	---	Petroglyph Trail - Pueblo Bonito to Chetro Ketl	National Park Service
17	Mù	Chaco Canyon	AD 800	AD 900-1120	AD 1250	Evaluating Models of Chaco - A Virtual Conference	University of Colorado
18	Wèi	Painted Rocks	AD 350- 550	AD 750-950	AD 900-1400	Kiva, Vol. 66, No 2, 2000.	Alexa M. Smith
19	Guŏ	Lyman Lake	6000 BC - AD 300	AD 300- 700	AD 1400	Interpreting the Prehistory of Lyman Lake State Park	Lyman Lake State Park
20	Guŏ	Atlatl Rock	300 BC	---	AD 1150	Valley of Fire brochure	Nevada Division of State Parks
20	Guŏ	Valley of Fire	AD 1-1200	AD 500-700	---	A Guide to Rock Art Sites - Southern California and Southern Nevada	David Whitley
21	Cì	Oklahoma	---	2700 BC - AD 850	---	Petroglyphs of Southeast Colorado and the Oklahoma Panhandle	Bill McGlone, Ted Barker, Phil Leonard
22	Tián	Piedras Marcadas Canyon	AD 500	AD 1300-1680	AD 1680	Petroglyph National Monument "What are Petroglyphs?"	National Park Service
23	Zhōu	Valley of Fire	AD 1-1200	AD 500-700	---	A Guide to Rock Art Sites - Southern California and Southern Nevada	David Whitley
24	Wèi	Valley of Fire	AD 1-1200	AD 500-700	---	A Guide to Rock Art Sites - Southern California and Southern Nevada	David Whitley
25	Guŏ	Piedras Marcadas Canyon	AD 500	AD 1300-1680	AD 1680	Petroglyph National Monument "What are Petroglyphs?"	National Park Service
26	Chǐ	Grapevine Canyon	AD 1200	--------	AD 1750	Grapevine Canyon - A Desert Oasis	National Park Service
27	Cì	St. Johns Arizona	6000 BC	--------	AD 1400	Interpreting the History of Lyman Lake State Park	Lyman Lake State Park
28	Wén	Jeffers Petroglyphs Historic Site	3000 BC	3000 - 500 BC & AD 900 -1750	AD 1750	The Jeffers Petroglyphs Site: A Survey and Analysis of the Carvings	Gordon Lothson
29	Wén	Boca Negra Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
30	Quăn	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
31	Huā	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service

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Independent Estimates for the Age of the Study Sites

- Continued -

Chart	Petroglyph	Location	Oldest Date	Most Common Date	Recent Date	Source Document	Author
32	Zhōu	Petrified Forest Arizona	AD 1	--------	AD 1350	Petrified Forest National Park - Messages on Stone	National Park Service
33	Shuĭ	Petrified Forest Arizona	AD 1	--------	AD 1350	Petrified Forest National Park - Messages on Stone	National Park Service
34	Mì	Petrified Forest Arizona	AD 1	--------	AD 1350	Petrified Forest National Park - Messages on Stone	National Park Service
35	Xiàng	Petrified Forest Arizona	AD 1	--------	AD1350	Petrified Forest National Park - Messages on Stone	National Park Service
36	Shŏu	Chaco Canyon	---	AD 850-1250	---	Petroglyph Trail - Pueblo Bonito to Chetro Ketl	National Park Service
37	Quăn	Grapevine Canyon	AD 1200	--------	AD 1750	Grapevine Canyon - A Desert Oasis	National Park Service
38	Yuān	Grapevine Canyon	AD 1200	--------	AD 1750	Grapevine Canyon - A Desert Oasis	National Park Service
39	Huā	Little Colorado River, Eager, Arizona	6000 BC - AD 300	AD 300- 700	AD 1400	Interpreting the Prehistory of Lyman Lake State Park	Lyman Lake State Park
40	Mì	Little Colorado River, Eager, Arizona	6000 BC - AD 300	AD 300- 700	AD 1400	Interpreting the Prehistory of Lyman Lake State Park	Lyman Lake State Park
41	Péng	Boca Negra Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
42	Péng	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
43	Péng	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
44	Wén	Coal Canyon	6000 BC	AD 600-1200	AD 1750	Help Protect the Past!	Bureau Of Land Management
45	Tŭ	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
46	Jí	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service

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Independent Estimates for the Age of the Study Sites

- Continued -

Chart	Petroglyph	Location	Oldest Date	Most Common Date	Recent Date	Source Document	Author
47	Dà Jiǎ	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
48	Gào	Piedras Marcadas Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
49	Wǔ	Piedras Marcadas Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
50	Xiàn	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
51	Gēng	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
52	Liángzhǔ Emblem	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
53	Xún	Rinconada Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service
54	Chè	Piedras Marcadas Canyon	2000 BC	AD 1300	AD 1680	Petroglyph National Monument - What Are Petroglyphs and Who Made Them?	National Park Service

Appendix C

Significant Values for the Jaccard Index of Similarity

Total Number of Attributes N	Critical Value for Probability (P) = 0.05	Critical Value for Probability (P) = 0.01	Critical Value for Probability (P) = 0.001
1	-	-	-
2	-	-	-
3	1.000	-	-
4	1.000	-	-
5	0.8000	1.000	-
6	0.8333	1.000	-
7	0.7143	0.8571	1.000
8	0.7500	0.8750	1.000
9	0.6667	0.7778	0.8889
10	0.7000	0.8000	0.9000
11	0.6364	0.7273	0.9091
12	0.6667	0.7500	0.8333
13	0.6154	0.6923	0.8462
14	0.6429	0.7143	0.7857
15	0.6000	0.6667	0.8000
16	0.5625	0.6875	0.7500
17	0.5882	0.6471	0.7647
18	0.5556	0.6667	0.7222
19	0.5789	0.6316	0.7368
20	0.5500	0.6500	0.7000

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Significant Values for the Jaccard Index of Similarity

- Continued -

Total Number of Attributes N	Critical Value for Probability (P) = 0.05	Critical Value for Probability (P) = 0.01	Critical Value for Probability (P) = 0.001
21	0.5714	0.6190	0.7143
22	0.5455	0.6364	0.6818
23	0.5217	0.6087	0.6957
24	0.5417	0.6250	0.6667
25	0.5200	0.6000	0.6800
26	0.5385	0.5769	0.6538
27	0.5185	0.5926	0.6667
28	0.5357	0.5714	0.6429
29	0.5172	0.5862	0.6552
30	0.5000	0.5667	0.6333
31	0.5161	0.5806	0.6452
32	0.5000	0.5625	0.6250
33	0.5152	0.5455	0.6364
34	0.5000	0.5588	0.6176
35	0.4857	0.5429	0.6286
36	0.5000	0.5556	0.6111
37	0.4865	0.5405	0.5946
38	0.5000	0.5526	0.6053
39	0.4872	0.5385	0.5897
40	0.4750	0.5250	0.6000

From: "Tables of significant values for Jaccard's Index of Similarity" by Raimundo Real (1999)

Supplemental Report #1

ANCIENT CHINESE ROCK WRITINGS CONFIRM EARLY TRANS-PACIFIC INTERACTION

Ancient Chinese Rock Writings Confirm Early Trans-Pacific Interaction
By John A. Ruskamp, Jr.

ANCIENT CHINESE ROCK WRITINGS CONFIRM EARLY TRANS-PACIFIC INTERACTION

John A. Ruskamp, Jr., Ed.D.

With input provided by the renowned sinologist David N. Keightley, Ph.D., and the Chief of Natural Resources at the Petroglyph National Monument, Michael Medrano, Ph.D., this paper documents and translates two sets of ancient, readable, and highly complex Chinese writings that were pecked into the rocks of Arizona and New Mexico approximately 2500 years ago. Here is the long sought and conclusive epigraphic evidence that Chinese explorers not only reached the Americas in pre-Columbian times, but that they interacted positively with Native populations, sharing both intellectual and cultural information.

由著名漢學家大衛・N.凱特利博士和國家岩畫紀念碑, 自然資源的首席主管麥可・梅德拉諾博士提供參考, 這份記錄報告解讀兩套, 大約2500年前刻在亞利桑那州和新墨西哥州岩石上, 高度複雜遠古的中國文字。這是長期追求和確鑿碑銘的實證, 說明中國探險家不僅在前哥倫布時期到達了美洲，並且與本地土著積極以文化知識互相交流。

Este trabajo documenta y traduce dos conjuntos de escritos chinos antiguos, legibles, y altamente complejos que fueron picoteados sobre rocas en Arizona y Nuevo México hace aproximadamente 2500 años. Aquí está la evidencia epigráfica largamente buscada y concluyente que exploradores chinos no solo llegaron a las Américas en la época precolombina, pero que interactuaron positivamente con las poblaciones nativas, intercambiando información cultural e intelectual.

The Written Record of an Ancient Chinese Offering

"John… You might perhaps, see the term Dà Jiǎ, A Shāng ancestor!"
David N. Keightley, Ph.D.

In a remote region of Albuquerque's Petroglyph National Monument, high above a sandy trail frequented daily by joggers and dog walkers alike, is a very old and readable set of ancient Chinese script petroglyphs (Figures 1 and 2). Here, in public view, yet remaining unrecognized and miscategorized, are the ancient written Chinese symbols of: Xiàn (to offer sacrifice in worship to deceased ancestors); Quǎn (dog); Dà (great); Jié (to kneel down in reverence); Dà Jiǎ (the name of the third king of the Shāng dynasty); and Gēng (the seventh Chinese Heavenly Stem).

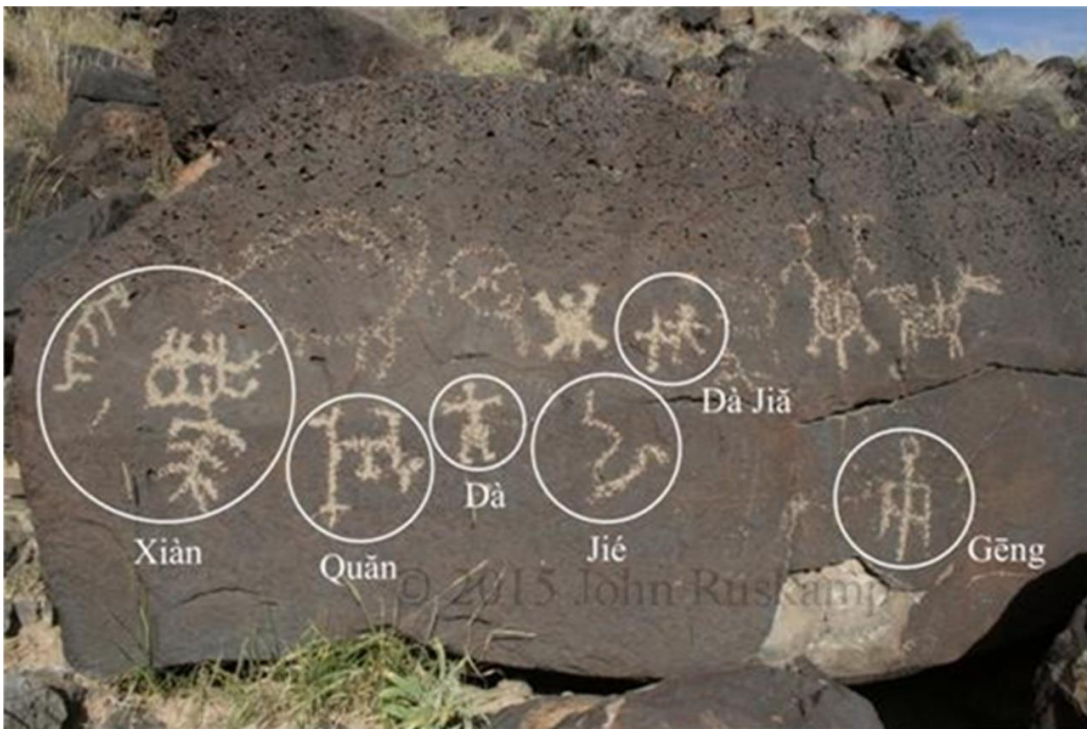

Figure 1. Ancient Chinese script petroglyphs in the Petroglyph National Monument

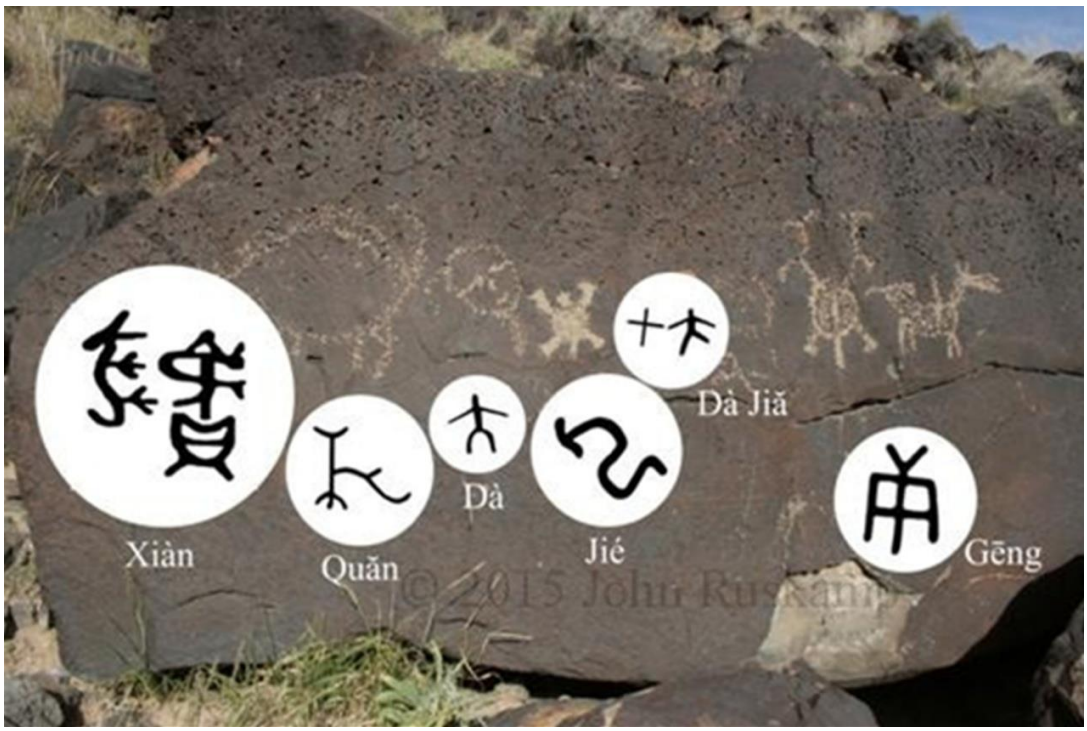

Figure 2. The boulder shown in Figure 1 with matching ancient Chinese pictograms inserted over their corresponding petroglyphs
Images from: Chalfant, Fazzioli, and Sears

Independently, David N. Keightley, Ph.D., considered by many to be "the foremost analyst of oracle texts in the West" (Eno 2010:2), has confirmed that these petroglyphs have the form of Chinese scripts. In fact, Keightley was the first to recognize the name of the Shāng king, Dà Jiǎ, upon this boulder, and communicated his insight with the following message: "John… You might perhaps, see the term Dà Jiǎ, A Shāng ancestor!" (personal communication, May 11, 2013).

Additionally, Michael F. Medrano, Ph.D., Chief, Division of Resource Management for the Petroglyph National Monument, personally evaluated the petroglyphs upon this boulder on November 13, 2013. With more than 25 years of experience working at the Monument with local Native cultures, upon viewing these figures, Medrano commented, "These images do not readily appear to be associated with local tribal entities," and "based on repatination appear to have antiquity to them."

The Recorded Message of the Pictogram-glyphs

Centrally located on this boulder, in the middle of a collection of discernable Chinese characters, is the serpentine bronze era script figure Jié, meaning to kneel down in reverence toward a greater authority. The illustrated message of this symbol (Figure 3), an individual bowing towards a superior while holding aloft his half of an imperial seal (Wieger 1965:147), may be understood as follows.

Figure 3. A man kneeling before his superior holding a royal seal in his hand
Drawing by Jennifer Mucha

The short vertical section atop this curvilinear drawing represents half of an imperial seal given to the man previously, as he now displays it to his superior. From the bottom of this section, the line abruptly bends to the right, depicting the arm of this respectful individual. It then reverses direction and curves to the left forming the outline of the man's body, before subsequently bending back to the right as the man's leg. Finally, this single line terminates with a small downward section, depicting the toes of the kneeling man as they touch the ground (Fazzioli 1987:67).

Pecked upon this boulder immediately in front of the kneeling figure of Jié, is the image of a stickman embellished with puffy pants and a shirt. While stickmen are common figures in North American rock

art, this particular figure exhibits an extraordinary amount of added detail (energy expended for its creation). It communicates to the observer that this man is, indeed, a very important person, someone worthy of deference. As a script, it is a larger-than-life form of the oracle-bone script Dà, meaning "great," and, appearing as it does upon this boulder, it affirms the interpretation provided above for the script Jié.

Written to the left of this image of Dà is the figurative Chinese seal era pictogram of a dog, Quǎn. And left of this canine logograph, near the edge of the boulder's west face, this singular row of four ancient Chinese scripts terminates with the boldly inscribed and highly complex bronze era depiction of Xiàn, meaning "to offer in worship to the deceased ancestors" (Wieger 1965:304).

Xiàn is a multifaceted figure, composed of three unique parts: a schematic depiction of the head of a tiger resting upon a cauldron with a dog strategically positioned alongside. Collectively, Keightley (personal communication, May 11, 2013) has verified the presence of these three graphic components in the figure Xiàn upon this Petroglyph National Monument boulder.

Reading the sequence of these four pictogram-glyphs in the traditional Chinese manner from right to left, beginning with the symbol Jié, we learn about a respectful man honoring a superior with the sacrificial offering of a dog. Notably, "that dog sacrifices were very popular in the second part of the second millennium B.C. in China is supported by evidence in oracle-bone inscriptions…" (Bulling 1977:9).

In addition to the four centrally located pictogram-glyphs pecked into the west face of this boulder, immediately above the character Jiè are two additional scripts used for writing the name of China's third Shāng emperor, Dà Jiǎ.

Furthermore, at the lower right side of this panel of rock writing is the oracle-bone symbol of Gēng, the seventh Heavenly Stem of the Chinese calendrical counting system.

In spite of the recognizable forms of these two supplementary scripts, determining a date for the creation of the incongruous styles of Chinese writing placed upon this boulder is no easy task. Nevertheless, all of these scripts exhibit the same level of repatination, indicating that they were created contemporaneously and that they are not recent specious fabrications (i.e., created after the rediscovery of oracle-bone script in A.D. 1899).

Insightfully, Keightley informs us in *Sources of Shāng History* that an emerging Shāng practice towards the end of the dynasty was to add the preface Dà (meaning "great") to the names of their kings, examples being Dà Jiǎ, Dà Gēng, and Dà Wù (Keightley 1978:207). Following the era of the Shāng, a different form of appellation gradually supplanted this custom. Therefore, the intentional placement upon this boulder of the title Dà as a simplistic stickman alongside of the name of Jiǎ, suggests that these logographic petroglyphs were inscribed near the end of the Shāng dynasty in 1046 B.C.

Mutually, the seal era Quǎn pictogram written upon this boulder and the adjoining bronze era script form of the Xiàn character located beside it support the above estimate for the age of these pictogram-glyphs. Informatively, the commingling of these multiple styles of Chinese script indicates that these writings were produced during a transitional period in Chinese calligraphy, likely after 1046 B.C. and not much later than 475 B.C., for, we are reminded that "…the different scripts did not follow one after

the other in orderly fashion, each growing from the previous one in a linear progression. They evolved over several centuries and often overlapped" (Wilkinson 2000:409).

The Ancient Poetic Record of a trans-Pacific Journey

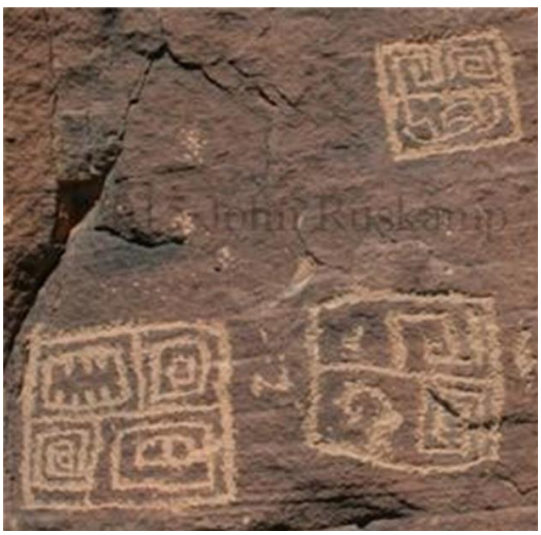

Figure 4. Arizona's ancient Chinese script cartouches

In east-central Arizona, approximately 250 miles southwest of Albuquerque, New Mexico, reside three ancient and uniquely subdivided petroglyph cartouches, each filled with readable combinations of ancient Chinese poetic (piánwén) scripts (Figure 4).

Instructively, the ancient Chinese author of these glyphs numbered two of the cartouches, thereby providing the reader with a visual cue for understanding both the alignment of the writings and their proper reading order. Beneath the first cartouche, the author inscribed the Chinese character Yī, meaning "one." In a like manner he labeled the second cartouche with the symbol of Yĭ, meaning "second." The third and final cartouche of this triad was not numbered.

Of note, these cartouches are all relatively small, measuring from 15 to 20 cm in length and width. Consequently, when they are viewed from even a short distance, they are inconspicuous upon this embellished rock outcropping. Evidently, the message preserved by these pictogram-glyphs was not intended to be a public announcement. Rather, as Keightley notes in his article concerning oracle-bone inscriptions published in *Archaeology of Asia,* "the incising mattered more than the writing," as they were "inscribed to leave a record rather than a document;" for "the importance of the inscriptions was that they were there, that they existed, not that they were read" (Keightley 2006:189-191).

Curiously, the scripts within each of the two numbered cartouches were rotated by the author 90 degrees to the left of vertical, while the symbols within the third and unnumbered cartouche were orientated in the opposite direction, 90 degrees to the right of vertical. The deliberate rotation of these writings, both to the left and right of vertical by an equal number of degrees, endorses their authenticity as rotation of individual scripts by ancient Chinese calligraphers is well-documented (Wilkinson 2000; Keightley 1978).

Cartouche 1
"Together for Ten Years"

Figure 5. Cartouche 1 with corresponding Chinese pictograms alongside
(Note: Photograph rotated 90 degrees to the right)
Images: Xún - Sears; Jiū - Sears; Yĭn - Chalfant; Yī - Karlgren

Purposefully, the ancient author of Cartouche 1 placed beneath it a single horizontal dash, the Chinese script Yī meaning "one" (Figure 5). The manner in which this numerical designation was inscribed beneath the outline of this cartouche informs observers to: a) rotate the figure 90 degrees to the right for reading; and b) "Start here."

Significantly, Cartouche 1 is subdivided into two equal and parallel sections, each of which is filled by a pair (couplet) of vertically oriented ancient Chinese scripts. Informatively, these two sets of aligned scripts have uniquely opposite mirror-like orientations, reminiscent of a reflective script oracle-bone pattern (Keightley 1978), and suggestive of folio pagination. The intentional separation of these vertically aligned scripts informs the reader that each couplet is to be interpreted independently and read sequentially.[1]

Within the top right segment of Cartouche 1 is the ancient Chinese script symbol of Yĭn, meaning "secluded" (Chalfant 1906: Plate XXXI), or alternatively, "secretly" or "hidden" (Morrison 1815:38). Below it, the author wrote the Chinese character Jiū, thereby adding to the meaning of Yĭn the concept of "togetherness." Collectively, these two scripts inform us about an implicit group of individuals who were ascetically isolated.

Likewise, the left half of Cartouche 1 also contains a pair of vertically aligned ancient Chinese scripts. Here are the backward oracle-bone figures of Xún, meaning "10 years," inscribed above a mirror image of the character Jiū as it appears within the right half of Cartouche 1. Collectively, these sets of paired scripts describe a team of individuals who have been together for a period of 10 years.

Cartouche 2
"The Journey Described"

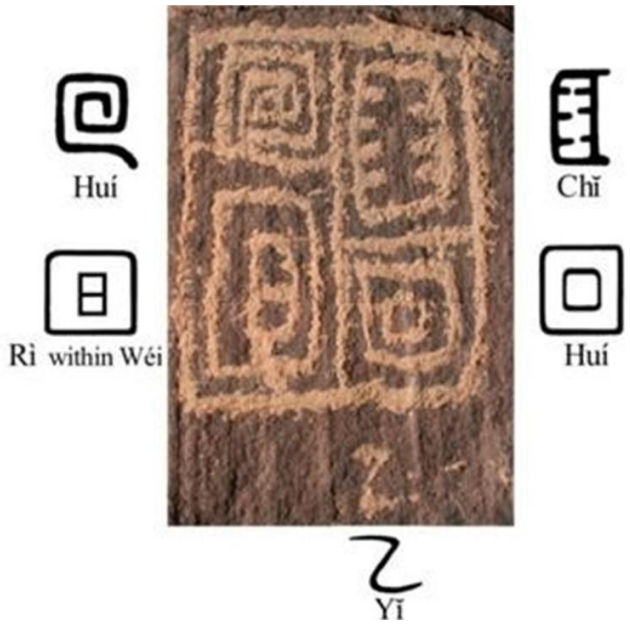

Figure 6. Cartouche 2 with corresponding Chinese pictograms alongside
(Note: Photograph rotated 90 degrees to the right)
Images: Huí (both) - Wieger; Rì - Sears; Wéi - Sears; Chĭ - Sears; Yĭ - Chalfant

In the same manner as Cartouche 1 is numbered by the symbol Yī, Cartouche 2 is identified as the second readable portion of this message by the purposeful placement of the Chinese script Yĭ, meaning "second," beneath its outline (Figure 6). Instructively, Cartouche 2 was pecked immediately to the left of Cartouche 1, confirming the intended reading order of these scripts, that is, from right to left as a conventional Chinese document.

Consistent with the orientation of the scripts in Cartouche 1 those identified within Cartouche 2 exhibit the same intentional rotation, 90 degrees to the left of vertical. However, unlike the author's bilateral division of the interior space of Cartouche 1, Cartouche 2 is subdivided into four unequal areas, each filled by a solitary script figure.

From top to bottom and right to left, the individual characters of Cartouche 2 appear in the following order: Chĭ (speech); Huí (return); Huí (completed journey); and the composite symbol of Rì (Sun) within Wéi (a wall) which when written together as in this instance together convey the meaning "House of the Sun."[2] Read in this manner, these four ancient Chinese pictogram-glyphs preserve the core message documented by these three cartouches i.e., "speaking about," "returning," "the journey completed," (to the) "House of the Sun." Moreover, and of prime importance, the message preserved by these pictograms conforms to the established 4-character poetic style of ancient Chinese piánwén literature.

Curiously, in the ancient Chinese text of the *Shan Hai Jing*, known since at least the fourth century B.C. (Bagrow and Skelton 2009:204), there is the somewhat fanciful account of an ancient expedition that journeyed to a land far beyond the East Sea (Pacific Ocean). Among other things, this early document asserts that this distant region is where the Sun and Moon rise, and that it contains an abyss called the "Big Chasm" (Birrell 1999:159), a possible reference, according to some, to the Grand Canyon.

Cartouche 3
"Returning Home Together"

Figure 7. Cartouche 3 with corresponding Chinese pictograms alongside
(Note: Photograph rotated 90 degrees to the left)
Images: Huí - Wieger; Jiū - Sears; Jiā - Sears

In the same manner as Cartouche 1, the interior space of Cartouche 3 is also bilaterally divided (Figure 7). However, the scripts written within it are oriented 90 degrees to the right of vertical, opposite to the positioning of the characters located within Cartouches 1 and 2.

Inscribed from top to bottom within the left section of Cartouche 3 are the ancient Chinese script figures of Huí (completed journey) and Jiū (together). This sequence of readable scripts reinforces the message of Cartouche 1 by emphasizing the unity of a successful journey carried out by a team of individuals.

Finally, in the adjoining right portion of Cartouche 3 is the solitary figure of an animal, in this case a line drawing of a pig. As this figure is fully enclosed by the interior and exterior lines of the cartouche it is understandable as a stylized form of the ancient Chinese bronze era word Jiā, meaning "home." Accordingly, the message preserved by the three pictogram-glyphs inscribed within Cartouche 3 may be understood as: "(Going) home, (the) journey completed together."

The Message of the Three Arizona Ranch Cartouches

Importantly, the author of the three Arizona cartouches described above employed an identifiable style of Chinese poetry for documenting his story. By enclosing sets of related scripts within numbered and subdivided outlines, he grouped his thoughts into stanzas as if they were paragraphs written upon successive pages, thereby indicating the reading order for properly comprehending his message. And, as William Boltz reminds us: "The interpretation of what any Chinese character depicts is always subjective and never the same thing as understanding what word the character writes, but if the interpretation is arrived at thoughtfully, and without recourse to unwarranted a priori assumptions,

it can sometimes be legitimately suggestive all the same of specific aspects of material culture" (Boltz 2009:107). And significantly, as Chen Liang-Chuan details below, when read aloud these Chinese scripts rhyme!

Consequently, by reading these ancient Chinese scripts in their prescribed sequence, beginning with Cartouche 1 and proceeding from top to bottom and then right to left, the entirety of the message recorded at this location is as follows.

Cartouche 1: "Sequestered (isolated) together, (for) 10 years together;"
Cartouche 2: "Speaking (of) returning, (the) journey completed (to the) House of the Sun;"
Cartouche 3: "(Going) home, (the) journey completed together."

An Alternative Poetic Translation of the Cartouches

When Chen Lung-Chuan of Taiwan read the symbols contained within the Arizona Ranch pictogram-glyph cartouches he immediately noted that the alignment and rhyming scheme of these ancient Chinese symbols identify them as piánwén poetry, a style of Chinese writing found in the ancient book of poems called the Shī Jīng which is believed to have been assembled sometime between the 11th and 7th centuries BC. This fact led David N. Keightley, Ph.D. to sugggest that these Arizona cartouches could have been created as early as the era of the Shī Jīng poems, that is, during the Zhōu dynasty (personal correspondence, July 19, 2015.)

The following is an alternative translation of the Arizona Ranch cartouche pictogram-glyphs provided by Chinese scholar Chen Lung-Chuan.

> "For the Cartouche 1 containing the Chinese pictograms of 隱 糾 旬 and 糾 I now know that there is an error in your research. The first "糾" is WRONG (i.e. It is not a LEFT-RIGHT reversion.) It is another word "互" which with its paired pictogram of "隱" corresponds in pronunciation with "寅虎" in Cartouche 3.
>
> Consequently, Cartouche 1 contains the symbols of 隱 互 旬 糾, which are pronounced respectively as Yĭn Hù Xún Jiū and may be translated as "Together left, 10 years together."
>
> (Note: the words Hù and Jiū found within Cartouche 1 rhyme with sounds much like the English words of "who" and "Jew.")
>
> Cartouche 2 contains the symbols of 齒 歌 回 and 朝, which are pronounced as Chĭ Gē Huí Cháo and may be understood as "Talking about the City of Song, Returning to the City of the Sun."
>
> Cartouche 3 contains the symbols of 寅 虎 回 and 糾, which are pronounced as Yín Hŭ Huí Jiū and may be translated as "In Year of Tiger, return together."

Believe me; this (find) is not simply about Archaeology, but also LITERATURE. It is a fantastic poem (or lyrics, if people can find the music scores of it), just like those you read in "詩 經" (the Shī Jīng).

The two "糾" in Cartouche 1 are DIFFERENT words; in fact, they should be in this way.

Cartouche 1 - 隱 糾 旬 互
Cartouche 2 - 齒 歌 回 朝
Cartouche 3 - 寅 虎 回 糾

Therefore;

A. This poem is integrally in rhythm by means of "朝" (in Cartouche 2) and "糾" (in Cartouche 3), according to ancient Chinese pronunciations.

B. The author was also playing the GAME OF PRONUNCIATIONS between the Cartouche 1 and Cartouche 3!

For Cartouches 1 and 3:

隱 pronounces like 寅
糾 pronounces like 糾
旬 pronounces like 回
互 pronounces like 虎

(If you look at the Cartouche 1, then make a big cross mark \"X\" thereon to get the Cartouche 3.)

CHEN Lung-Chung 2015-08-12 Taipei"

Shared North American and Asiatic Symbolism

Multiple times the ancient author of the cartouches described above recorded his message with graphic images that were, and still are, understood in the same manner by both Native American and Asiatic populations.

The first of these mutually symbolic figures portrays the interlocking fingers of two hands. Persisting into modern times, the Hopi people of North America refer to this figure as "Nakwách," and understand it as their symbol for "brotherhood" and "friendship" (Figure 8). Chinese calligraphers, both ancient and modern, use an identical figure, Jiū (Figure 9), which for them represents the twisting of multiple items into one (Wieger 1965:145). For the Chinese, the figure of Jiū conveys the idea of "togetherness," in much the same manner as the Nakwách symbol is now, and has been in the past, understood by the Hopi.

Figure 8. Hopi Nakwách symbol
Image: Frank Waters

Figure 9. Chinese script Jiū
Image: Matsumaru & Takashima

A second prominent example of the parallel symbolism employed by North American and Asiatic authors, evident in the study cartouches, is their joint use of a rectilinear spiral to convey the concept of a "round-trip journey" (Figure 10). This symbol, pronounced as Huí by the Chinese, appears frequently in North American rock art, both as a singular object and in repetitive patterns. Historically, the Hopi have used this symbol to portray the four complete migrations that their legendary god Massau instructed them to make, once to each of the four cardinal directions (Figure 11). Curiously, "…among all Pueblo Indians the cardinal directions, the zenith, and the nadir are associated with specific colors, and color and directional symbolism are important" (Cordell 1997:17). The fact that these same color patterns are associated with the Chinese, and are equally important for them, has also been noted (Davis 2001:xxx; Zeilik 1986:S8).

Figure 10. The Chinese pictogram Huí
Image: L. Wieger

Figure 11. Linked Native American rectilinear spirals

A Brief History of Chinese Writing

The history of writing is a multifarious topic. From humankind's earliest use of signs and symbols, through proto-writing, to the development of formal script systems, there is considerable debate about just what constitutes true writing. Still, most scholars agree that "Writing arose, as far as we know, *ex nihilo* only three times in old-world antiquity: in Egypt, in Mesopotamia, and in China, and once in the new world, viz., the Mayan script of Mesoamerica" (Boltz 2003:10).

Throughout the evolution of Chinese script, it has remained a highly pictographic form of writing, relying upon imagery (graphemes) to convey meanings rather than employing symbols for the individual speech sounds (phonemes) of the language.

The earliest known, fully developed, example of Chinese writing, oracle-bone script, appears in the historical record around 1700 B.C. From this early date, and for approximately the next 600 years, oracle-bone script was primarily carved into animal bones.

Of singular importance for dating the pictogram-glyphs of this study, knowledge of oracle-bone script was totally lost to humanity for over two millennia following the collapse of the Shāng dynasty in 1046 B.C. Once lost, it remained unknown until A.D. 1899 when ancient bones inscribed with oracle-bone script were recovered from an archaeological site near Ānyáng, China. However, although more than 100 years have passed since its rediscovery, the task of fully deciphering oracle-bone script is not complete. To date, the meaning for approximately 50 percent of the 5,000 known figures remains a mystery (Wilkinson 2000:397).

Following the demise of the Shāng, newer styles of writing appeared which eventually supplanted oracle-bone calligraphy (Figure 12). However, prior to the standardization of writing in China around 200 B.C., scribes were free to independently modify, personalize, and embellish their scripts as they desired. Accordingly, there evolved an overwhelming plethora of new symbols, which, unfortunately, were seldom widely understood. This unregulated profusion of script characters became such a problem for the average Chinese reader that, in approximately 500 B.C., even the learned Confucius complained "of scribes who were dishonest and instead of leaving blanks when they forgot characters, made new ones" (Wilder and Ingram 1922:iv).

With time, the invention and widespread adoption of new and improved writing technologies, such as the brush and ink, required that stylistic changes be made in Chinese characters, rewarding their conformity. Subsequently, each major style of Chinese writing is now associated with a particular historical period. Therefore, although Chinese writing was generally unregulated early on, its major calligraphic styles are very datable and are especially useful for determining the approximate age of written records.

Figure 12. Evolution of Selected Chinese Pictograms
Images from: Fazzioli; Sears; and Wieger

Discussion

Bruce Trigger reminds us… the ultimate goal for the field of archaeology "must be to recover knowledge of what has been forgotten" (Trigger 2006:531). Demonstrably, and with manifold robust proofs, this study fulfills that quest; it has recovered previously overlooked intellectual information preserved by ancient Chinese scripts embedded within the North American rock art record.

The authorship of North American rock writing is a highly controversial and politically charged topic. While ancient stone glyphs evoke curiosity in many observers, by their very nature they are extraordinarily difficult to date by any established scientific methodology (Donald Graczyk: Chemist; Inorganic Analysis Technical Lead at Argonne National Laboratory, personal communication, May 17, 2013; Patterson 1992:4). Although a few knowledgeable rock art researchers have put forth plausible explanations for particular rock art symbols, most prudent investigators avoid assigning meaning or authorship to these figures. This inclination is largely due to the characteristic uncertainty of rock art imagery (Patterson 1992), and the sometimes-wild speculations which have been and, unfortunately, still are found in some rock art research reports (Ruskamp 2016).

Similar to the controversy involving rock writing, the theory of pre-Columbian trans-Pacific voyages to the Americas has also been a hotly debated topic for over 250 years. Although the facts referenced by various reputable scholars support early trans-Pacific interaction, most professional archaeologists have dogmatically rejected the idea. This reluctance is largely because there has been a dearth of primary

supporting evidence, such as the discovery of an undisturbed early period Asiatic relic or village in the Americas. However, as Henriette Mertz suggests in *Pale Ink,* "It would be a relatively simple matter if the Chinese Buddhists had been as thoughtful as 'Kilroy' and had taken time out to have carved their names in Chinese characters on solid rock, together with a date." "If they did, perhaps we have not yet recognized it" (Mertz 1953:16-17).

Concerning the elucidation of rock art, the noted researcher Col. Garrick Mallery cautions that "no attempt should be made at symbolic interpretation unless the symbolic nature of the particular characters under examination is known or can be logically inferred from independent facts" (Mallery 1893:767). Quantifiably, the line strokes and inter-stroke touch relationships comprising each of this study's Chinese pictogram-glyphs have been statistically correlated, each at or above the 95 percent probability level, with a known ancient Chinese script symbol by application of the Jaccard Similarity Coefficient formula (Table 1). Collectively, these analyses confirm that the Chinese script petroglyphs evaluated in this study were not created, each for a second time, apart from Chinese influence.

Pictogram-Petroglyph Comparison Data

Chinese Pictogram	Location of Petroglyph	*J*	P	N
Bronze era Xiàn	Petroglyph National Monument	1.000	0.001	7
Seal era Quǎn	Petroglyph National Monument	0.667	0.01	15
Bronze era Jié	Petroglyph National Monument	0.692	0.01	13
Oracle-bone Dà Jiǎ	Petroglyph National Monument	1.000	0.01	5
Oracle-bone Gēng	Petroglyph National Monument	0.667	0.01	15
Oracle-bone Chǐ	Arizona Ranch	0.864	< 0.001	22
Oracle-bone Xún	Arizona Ranch	1.000	0.01	5
Oracle-bone Yǐ	Arizona Ranch	1.000	0.01	5
Oracle-bone Rì	Arizona Ranch	0.846	< 0.001	13
Oracle-bone Wéi	Arizona Ranch	1.000	0.001	8
Seal era Húi	Arizona Ranch	1.000	< 0.001	17
Seal era Húi	Arizona Ranch	1.000	< 0.001	16
Oracle-bone Jiū	Arizona Ranch	0.615	0.05	13
Bronze era Jiā	Arizona Ranch	0.600	0.05	15

Key
J = Calculated value of the Jaccard Similarity Coefficient
P = Probability for the calculated value of *J* occurring by chance
N = Total number of line stroke and inter-stroke touch relation attributes

Note: Three of the petroglyphs evaluated in this report are not included in the above data set. Both the Yǐn and Yǐ symbols lack the minimum number of attributes necessary for making a comparative statistical analysis with the formula of the Jaccard Similarity Coefficient. In addition, while readable, the large Rinconada Canyon stickman petroglyph is an embellished drawing, not a pictographic symbol.

Table 1. Chinese pictogram - petroglyph correlation values generated by application of the Jaccard Similarity Coefficient

Furthermore, independent evaluations of the study's pictogram-glyphs performed by multiple epigraphic authorities confirm their readability as ancient Chinese writings. And significantly, the sequence in which the ancient Chinese scripts of Gēng, Jié, Dà, Quǎn, and Xiàn were pecked into the patina of this

Rinconada Canyon boulder conform with a known style of writing that was commonly employed for chronicling oracle-bone era sacrificial rites.

For recording sacrificial rites during the Shāng and Zhōu dynasties, characteristically Chinese scribes would begin by documenting the date of the divination followed in order by the sequential pattern of symbols for the subject of the testing, the King, the object of veneration, and the sacrificial action taken (Yuán 2009). The syntax of *wáng bīn* oracle-bone inscriptions usually follows this pattern:

干支卜 Divined on a *gānzhī*-day	某貞 Someone tested	王賓 The King present	祭祀對象 Object of veneration	祭祀動詞 Sacrifice verb	亡尤(亡咎) Inquiry about the usefulness

Figure 13. The regular pattern employed for recording *wáng bīn* sacrificial rites
From: *Sacrificial Rites for Ancestors during the Shāng and Zhōu Dynasties*

Reading the Rinconada boulder pictogram-glyphs from right to left beginning with the oracle-bone era symbol of Gēng (meaning "seventh") the syntax of the following symbols of Jié (the subject), Dà (the King present), Quǎn (the venerated object), and Xiàn (the sacrificial rite), conform with this style of ancient writing. Consequently, not only are these long overlooked New Mexican petroglyphs readable as ancient Chinese symbols, their reading order conforms with a known style of writing frequently employed during the Shāng and Zhōu dynasties for recording sacrificial events such as the one inscribed at this site.

Demonstrably, the literary attributes of this study's pictogram-glyphs provide compelling and conclusive evidence that, before oracle-bone characters were fully supplanted by newer forms of Chinese script… "literate Chinese were present early on in North America" (Ruskamp 2016:89). However, there are no known eyewitness accounts detailing the authorship of these ancient rock writings. Moreover, to date, the physical dating of petroglyphs remains inherently unreliable and technically elusive. Still, we are reminded that: "In the absence of sufficiently precise absolute dates, arrived at by carbon-14 dating or some other method, and in the absence of sufficiently precise relative dates, arrived at by analogical or stratigraphic criteria, the inscriptions themselves provide our most reliable evidence for relative dating" (Keightley 1978:94).

Importantly, both the complexity and quantity of the readable combinations of Chinese scripts found at the study's primary sites in Arizona and New Mexico reveal that the author(s) of these pictogram-glyphs had an extensive Chinese vocabulary and knowledge of ancient Chinese literary styles (Ruskamp 2016). Notably, as part of their historical calligraphic development, the Korean, Japanese, and Vietnamese peoples each supplanted their earliest form of writing with Chinese script. However, these appropriations occurred following the domination of Vietnam by China's Han dynasty (221 B.C. - A.D. 206); subsequent to the introduction of Buddhism in Korea around 500 B.C.; and in the case of Japan, during more recent times (ca. A.D. 700) when knowledge of oracle-bone script was well extinguished from human memory. Consequently, the ancient oracle-bone style pictogram-glyphs identified by this research endeavor cannot be credited to an Asiatic population outside of China.

Frequently, Native Americans attribute the production of ancient rock art to their ancestors. However, thus far, little if any conclusive proof for the authorship of North American rock art has been offered (Cole 1990:4). Generally, the greater the age of a rock depiction the less is known about it. Consequently, the best answer for the authorship of these enigmatic illustrations is that they are "messages from the ancestors, which, though no longer decipherable, remain signs from the past" (Young 1985:3).

In spite of this vagueness, the extensive Chinese vocabulary evidenced at each location evaluated in this report advocates against the authorship of the figures being credited to Native Americans. None of the more complex Chinese figures identified by this study are known to have any Native tribal affiliation (Medrano 2013); and if these writings were Native accomplishments, there should be additional examples nearby. To date, after the review of over 175 regional rock art locations, containing hundreds of thousands of individual figures, no further examples of such uniquely complex patterns of Chinese pictogram-glyphs have been identified.

Conclusion

Accordingly, what *is* certain is that *the origin* of the significantly repatinated and uniquely styled Asiatic script symbols identified in this report must be consigned to China, for "The Chinese script is obviously an original system of signs created to record an ancestral form of the Chinese language" (Houston 2008:258); and never in the history of humanity has such a uniquely complex and readable set of characters been invented more than once.

Therefore, in conclusion, and in contrast to any previous historical uncertainty, the comparative evidence presented in this report, which is supported by both analytical evaluation and expert opinion, documenting the presence of readable sequences of old Chinese scripts located upon the rocks of North America, establishes that prior to the extinction of oracle-bone script from human memory, approximately 2,500 years ago, trans-Pacific exchanges of epigraphic intellectual property took place between Chinese and North American populations.

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Notes

1. Unlike the vertical orientation of the two sets of script parings located within Cartouche 1, when two Chinese characters are written horizontally as side-by-side "phono-semantic compounds" they have a single meaning apart from that of their component scripts. In such cases, one symbol is a symbolic figure communicating an overall meaning, and the other character functions as a phonetic item providing the reader with a clue for the proper pronunciation of the word.

2. Two different symbols located in Cartouche 2 are pronounced and spelled in modern pinyin Chinese as Huí. Nevertheless, they are composed of different line stroke patterns and have different meanings.

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Supplemental Report #2

THE ANCIENT CHINESE WRITINGS OF THE MOJAVE DESERT

The Ancient Chinese Writings of the Mojave Desert
By John A. Ruskamp, Jr.
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The Ancient Chinese Writings of the Mojave Desert

John A. Ruskamp, Jr., Ed.D.

This, the second supplemental report of the ongoing study "Asiatic Echoes," documents and translates sixteen ancient, identifiable, and highly complex Chinese script images that were pecked into the rocks of a remote Southern California desert canyon approximately 2500 years ago. Significantly, many of these identifiable petroglyphs are of a style matching that of ancient Chinese oracle-bone writings, a long-forgotten form of writing associated with China's Shang Dynasty (1500 - 1046 BC).

In all of human history, there is no record of a writing system being invented more than one time. Consequently, this collection of uniquely identifiable scripts provides demonstrable and prodigious proof that long ago, and in pre-Columbian times, literate Chinese explorers were present in North America.

In a small canyon located in a remote section of Southern California's Mojave Desert reside no fewer than sixteen long overlooked and, until now, unrecognized ancient Chinese script petroglyphs. Significantly, knowledge of the distinctive ancient oracle-bone style of Chinese writing displayed by many of these Mojave Desert pictogram-glyphs was lost to humanity following the fall of China's Shang Dynasty in 1046 BC. Only relatively recently, in AD 1899 at Anyang, China, was oracle-bone script subsequently rediscovered and deciphered. Consequently, these Mojave Desert writings, identified and confirmed by multiple world-renown sinologists as having forms matching known ancient Chinese characters, are reliably readable and datable.

Of no small importance to the serious historian or rock art researcher, the repatination levels evident upon these ancient Chinese symbols indicate that they are not recent specious fabrications. Demonstrably these glyphs were created long before oracle-bone script resurfaced in AD 1899 and, as no form of writing has ever been invented more than once in human history, there is only one credible explanation for the existence of these images… that is, approximately 2,500 years ago, and shortly following the demise of China's Shang empire, literate Chinese individuals were in North America and created these historically significant and previously overlooked messages.

As part of the ongoing independent study of "Asiatic Echoes", a statistical comparison was made of the line strokes comprising each of these petroglyphs with those of known ancient Chinese pictograms. The results of these calculations, generated by application of the Jaccard Index of Similarity, reveal that the apparent similarity of each of these petroglyph and script pairings could only be credited to an unrelated chance event less than one percent of the time, and in most of the cases this value is less than one in a thousand. Collectively, the probability for the chance occurrence of all sixteen of these identifiable symbols being independently invented, and at a single location, is then less than one chance out of 10^{-40}. That is, the likelihood that these sixteen identifiable ancient Chinese symbols were created independently, apart from knowledge of ancient Chinese writing, is less likely than the chance of picking up one particular grain of sand from off the whole surface of the earth!

On the following pages are photographs of the sixteen Mojave Desert petroglyphs discussed above. Each photo is accompanied by an illustration of its corresponding ancient Chinese script pictogram.

The Mojave Desert Chinese Pictogram-glyphs

Jiàn pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Jiàn (look / see) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: $P < 0.001$)

Gān pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Gān (dry) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P = 0.01)

Guó pictogram
Image: Richard Sears

Wáng
Image: Chalfant

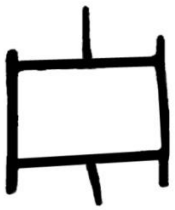
Mojave Desert glyphs

Chinese composite Guó (nation) and Wáng (king) Pictograms vs. conjoined Mojave Desert glyphs
(Calculated probability for a chance similarity: P < 0.001)

Jiŭ pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Jiŭ (liquor) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P < 0.001)



Zhù pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Zhù (granary) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P = 0.01)

Mǔ pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Mǔ (mother) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P < 0.001)

Fū pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Fū (man) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P < 0.001)

Gān pictogram
Image: Chinese Text Project

Mojave Desert glyph

Chinese Gān (sweet) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P = 0.001)

Zhōu pictogram
Image: Bernhard Karlgren (GSR)

Mojave Desert glyph

Chinese Zhōu (boat) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P = 0.01)

Bāng pictogram
Image: Bernhard Karlgran (GSR)

Mojave Desert glyph

Chinese Bāng (state or nation) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P < 0.001)

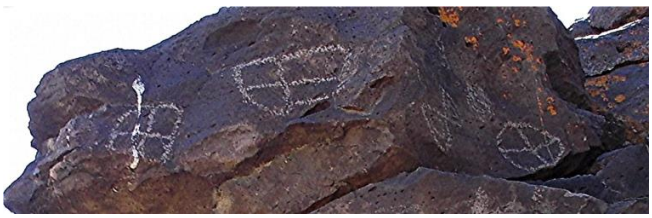
Dāo pictogram
Image: Karlgren (GSR)

Cì pictogram
Image: Wieger

Mojave Desert paired glyphs

Chinese Composite Dāo & Cì (stab) Pictograms vs. Mojave Desert glyphs
(Calculated probability for a chance similarity: P < 0.001)

Tián pictogram
Image: Karlgren (GSR)



Mojave Desert glyph

Chinese Tián (field) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P < 0.001)

Zhōng pictogram
Image: Wieger

Mojave Desert glyph

Chinese Zhōng (middle) Pictogram vs. Mojave Desert glyph
(Calculated probability for a chance similarity: P = 0.001)

Cè pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Cè (book) Pictogram vs. Mojave Desert Glyph
(Calculated probability for a chance similarity: $P < 0.001$)

Zōng pictogram
Image: Richard Sears

Mojave Desert glyph

Chinese Zōng (ancestor) Pictogram vs. Mojave Desert Glyph
(Calculated probability for a chance similarity: $P = 0.05$)

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Supplemental Pictogram-glyph Comparison Charts

Chart 55
Chinese Shé (tongue) Pictogram vs. Grapevine Canyon Petroglyph

Shé pictogram
Image: Wilder & Ingram

Grapevine Canyon glyph

Part 1. Comparison of line strokes

Shé pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
Vertical #1 (center line)	Vertical (center line)	Yes
Arc up #1	Horizontal #1 (top)	No
Horizontal #1 (middle)	Horizontal #2 (middle)	Yes
Horizontal #2 (bottom)	Horizontal #3 (bottom)	Yes
Arc up #2	Arc up	Yes

Part 2. Comparison of line stroke touch relations

Shé pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
Junction - vertical #1 & arc up #1	Junction - vertical #1 & horizontal #1	Yes
Intersection - vertical #1 & horizontal #1	Intersection - vertical #1 & horizontal #2	Yes
Junction - vertical #1 & horizontal #2	Junction - vertical #1 & horizontal #2	Yes
Junction - horizontal #2 & arc up #2 (left)	Connection - horizontal #3 & arc up (left)	No
Junction - horizontal #2 & arc up #2 (right)	Connection - horizontal #3 & arc up (right)	No

Calculation of Jaccard's Index for the comparison of the Shé pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 7
Total number of features N = 10
For Index of Similarity calculation: M10 = 3; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{3 + 0 + 7} = \frac{7}{10} = 0.7000$$

For N = 10 and $J = 0.7000$; P = 0.05

Chart 56
Chinese Zhōng (middle) Pictogram vs. Grapevine Canyon Petroglyph

Zhōng pictogram
Image: L. Wieger

Grapevine Canyon glyph

Part 1. Comparison of line strokes

Zhōng pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
Vertical #1 (center line)	Curve right (center line)	No
Vertical #2 (left)	Vertical #2 (left)	Yes
Vertical #3 (right)	Vertical #3 (right)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #3 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Zhōng pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
Intersection - vertical #1 & horizontal #1	Intersection - curve right & horizontal #1	Yes
Intersection - vertical #1 & horizontal #2	Intersection - curve right & horizontal #2	Yes
Connection - vertical #2 & horizontal #1 (left)	Connection - vertical #2 & horizontal #1 (left)	Yes
Connection - vertical #2 & horizontal #2 (left)	Connection - vertical #2 & horizontal #2 (left)	Yes
Connection - vertical #3 & horizontal #1 (right)	Connection - vertical #2 & horizontal #1 (right)	Yes
Connection - vertical #3 & horizontal #2 (right)	Connection - vertical #2 & horizontal #2 (right)	Yes

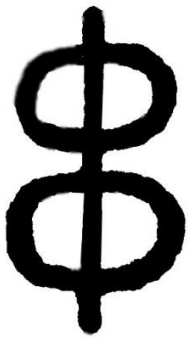
Calculation of Jaccard's Index for the comparison of the Zhōng pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 10
Total number of features N = 11
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{1 + 0 + 10} = \frac{10}{11} = 0.9091$$

For N = 11 and $J = 0.9091$; P = 0.001

Chart 57
Chinese Chuàn (to string together) Pictogram vs. Sloan Canyon Petroglyph



Chuàn pictogram
Image: L. Wieger

Sloan Canyon glyph

Part 1. Comparison of line strokes

Chuàn pictogram line strokes	Sloan Canyon glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Circle #1 (top)	Circle #1 (top)	Yes
Circle #2 (bottom)	Circle #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Chuàn pictogram line stroke relations	Sloan Canyon glyph line stroke relations	Shared Relation
Intersection - circle #1 & vertical (top)	Intersection - circle #1 & vertical (top)	Yes
Intersection - circle #1 & vertical (top center)	Intersection - circle #1 & vertical (top center)	Yes
Intersection - circle #2 & vertical (bottom center)	Intersection - circle #2 & vertical (bottom center)	Yes
Intersection - circle #2 & vertical (bottom)	Intersection - circle #2 & vertical (bottom)	Yes

Calculation of Jaccard's Index for the comparison of the Chuàn pictogram with the Sloan Canyon petroglyph

Total number of shared features M11 = 7
Total number of features N = 7
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{0 + 0 + 7} = \frac{7}{7} = 1.0000$$

For N = 7 and $J = 1.0000$; P = 0.001

Chart 58
Chinese Jīn (double cloth) Pictogram vs. Sloan Canyon Petroglyph

Jīn pictogram
Image: Wilder & Ingram

Sloan Canyon glyph

Part 1. Comparison of line strokes

Jīn pictogram line strokes	Sloan Canyon glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Arc down #1	Arc down #1	Yes
Arc down #2	Arc down #2	Yes

Part 2. Comparison of line stroke touch relations

Jīn pictogram line stroke relations	Sloan Canyon glyph line stroke relations	Shared Relation
Intersection - arc down #1 & vertical (below top)	Intersection - arc down #1 & vertical (below top)	Yes
Intersection - arc down #2 & vertical (above center)	Intersection - arc down #2 & vertical (above center)	Yes

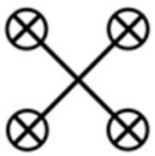
Calculation of Jaccard's Index for the comparison of the Jīn pictogram with the Sloan Canyon petroglyph

Total number of shared features M11 = 5
Total number of features N = 5
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{0 + 0 + 5} = \frac{5}{5} = 1.0000$$

For N = 5 and $J = 1.0000$; P = 0.01

Chart 59
Chinese Léi (thunder) Pictogram vs. Grapevine Canyon Petroglyph



Léi pictogram
Image: Frank Chalfant

Grapevine Canyon glyph

Part 1. Comparison of line strokes

Léi pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
Diagonal up	Diagonal up	Yes
Diagonal down	Diagonal down	Yes
Circle #1 (top left)	Circle #1 (top left)	Yes
Circle #2 (top right)	Circle #2 (top right)	Yes
Circle #3 (bottom right)	Circle #3 (bottom right)	Yes
Circle #4 (bottom left)	Circle #4 (bottom left)	Yes
None	Circle #5 (cartouche)	No
X within circle #1-4	Filled-in circle #1-4	No x 4

Part 2. Comparison of line stroke touch relations

Léi pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
Intersection - diagonal up & diagonal down	Intersection - diagonal up & diagonal down	Yes
Connection - circle #1 & diagonal down (top)	Connection - circle #1 & diagonal down (top)	Yes
Connection - circle #2 & diagonal up (top)	Connection - circle #2 & diagonal up (top)	Yes
Connection - circle #3 & diagonal down (bottom)	Connection - circle #3 & diagonal down (bottom)	Yes
Connection - circle #4 & diagonal up (bottom)	Connection - circle #4 & diagonal up (bottom)	Yes
Placement - X within circle #1	Placement - fill-in of circle #1	Yes
Placement - X within circle #2	Placement - fill-in of circle #2	Yes
Placement - X within circle #3	Placement - fill-in of circle #3	Yes
Placement - X within circle #4	Placement - fill-in of circle #4	Yes
None	Placement - circle #5 as cartouche	No

Calculation of Jaccard's Index for the comparison of the Léi pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 15
Total number of features N= 21
For Index of Similarity calculation: M10 = 4; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{4 + 2 + 15} = \frac{15}{21} = 0.7143$$

For N = 21 and $J = 0.7143$; P = 0.001

Chart 60
Chinese Wáng (string of beads) Pictogram vs. Sloan Canyon Petroglyph

Wáng pictogram
Image: Frank Chalfant

Sloan Canyon glyph

Part 1. Comparison of line strokes

Wáng pictogram line strokes	Sloan Canyon glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Dot #1 (top)	Dot #1 (top)	Yes
Dot #2 (middle)	Dot #2 (middle)	Yes
Dot #3 (bottom)	Dot #3 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Wáng pictogram line stroke relations	Sloan Canyon glyph line stroke relations	Shared Relation
Connection - dot #1 & vertical (top)	Intersection - dot #1 & vertical (top)	No
Intersection - dot #2 & vertical (middle)	Intersection - dot #2 & vertical (middle)	Yes
Connection - dot #3 & vertical (bottom)	Intersection - dot #3 & vertical (bottom)	No

Calculation of Jaccard's Index for the comparison of the Wáng pictogram with the Sloan Canyon petroglyph

Total number of shared features M11 = 5
Total number of features N = 7
For Index of Similarity calculation: M10 = 2; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{2 + 0 + 5} = \frac{5}{7} = 0.7143$$

For N = 7 and $J = 0.7143$; P = 0.05

Chart 61
Chinese Mù (tree) Pictogram vs. Sloan Canyon Petroglyph

Mù pictogram
Image: Richard Sears

Sloan Canyon glyph

Part 1. Comparison of line strokes

Mù pictogram line strokes	Sloan Canyon glyph line strokes	Shared Feature
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down (left branch)	Diagonal down (left branch)	Yes
Diagonal up (right branch)	Curve up (right branch)	No
Diagonal up (left root)	Diagonal up (left root)	Yes
Diagonal down (right root)	Diagonal down (right root)	Yes

Part 2. Comparison of line stroke touch relations

Mù pictogram line stroke relations	Sloan Canyon glyph line stroke relations	Shared Relation
Junction - diagonal down (left branch) & … vertical above center	Junction - diagonal down (left branch) & … vertical above center	Yes
Junction - diagonal up (right branch) & … vertical above center	Junction - curve up (right branch) & … vertical above center	Yes
Junction - diagonal up (left root) & … vertical below center	Junction - diagonal up (left root) & … vertical below center	Yes
Junction - diagonal down (right root) & … vertical below center	Junction - diagonal down (right root) & … vertical below center	Yes

Calculation of Jaccard's Index for the comparison of the Mù pictogram with the Sloan Canyon petroglyph

Total number of shared features M11 = 8
Total number of features N = 9
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{1 + 0 + 8} = \frac{8}{9} = 0.8889$$

For N = 9 and $J = 0.8889$; P = 0.001

Chart 62
Chinese Fù (hill) Pictogram vs. Piedras Marcadas Petroglyph

Fù pictogram
Image: Edoardo Fazzioli

Piedras Marcadas glyph

Part 1. Comparison of line strokes

Fù pictogram line strokes	Piedras Marcadas glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Diagonal down #1 (top)	Diagonal down #1 (top)	Yes
Diagonal up #1 (top)	Diagonal up #1 (top)	Yes
Diagonal down #2 (middle)	Diagonal down #2 (middle)	Yes
Diagonal up #2 (middle)	Diagonal up #2 (middle)	Yes
Diagonal down #3 (bottom)	Right curve	No
Diagonal up #3 (bottom)	None	No

Part 2. Comparison of line stroke touch relations

Fù pictogram line stroke relations	Piedras Marcadas glyph line stroke relations	Shared Relation
Connection - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	No
Connection - diagonal down #1 & … diagonal up #1	Connection - diagonal down #1 & … diagonal up #1	Yes
Junction - diagonal up #1 & vertical	Junction - diagonal up #1 & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down #2 & vertical	Yes
Connection - diagonal down #2 & … diagonal up #2	Connection - diagonal down #2 & … diagonal up #2	Yes
Junction - diagonal up #2 & vertical	Connection - diagonal up #2 & vertical	Yes
Junction - diagonal down #3 & vertical	Junction - right curve (top) & vertical	Yes
Connection - diagonal down #3 & … diagonal up #3	None	No
Junction - diagonal up #3 & vertical	Junction - right curve (bottom) & vertical	Yes

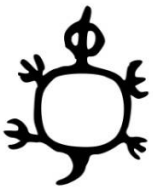
Calculation of Jaccard's Index for the comparison of the Fù pictogram with the Piedras Marcadas petroglyph

Total number of shared features M11 = 12
Total number of features N = 16
For Index of Similarity calculation: M10 = 4; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{12}{4 + 0 + 12} = \frac{12}{16} = 0.7500$$

For N = 16 and $J = 0.7500$; P = 0.001

Chart 63
Chinese Guī (turtle) Pictogram vs. Rinconada Canyon Petroglyph



Guī pictogram
Image: Richard Sears

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Guī pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Circle (body)	Circle (body)	Yes
Trifid forefoot (left)	Trifid forefoot (left)	Yes x 3 lines
Trifid forefoot (right)	Trifid forefoot (right)	Yes x 3 lines
Trifid hind foot (left)	Trifid hind foot (left)	Yes x 3 lines
Trifid hind foot (right)	Trifid hind foot (right)	Yes x 3 lines
Curve right (tail)	Curve right (tail)	Yes
Line#1 (foreleg left)	Line#1 (foreleg left)	Yes
None	Line#2 (foreleg right)	No
Line#2 (hind leg left)	Line#3 (hind leg left)	Yes
Line#3 (hind leg right)	Line#4 (hind leg right)	Yes
Vertical (head line)	None	No
Circle (head)	Circle (head)	Yes
None	Vertical (shell spine)	No

Part 2. Comparison of line stroke touch relations

Guī pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Junction - forefoot (left) & line (foreleg left)	Junction - forefoot (left) & line (foreleg left)	Yes
Junction - forefoot (right) & circle (body)	Junction - forefoot (right) & line (foreleg right)	No
Junction - hind foot (left) & line (hind leg left)	Junction - hind foot (left) & line (hind leg left)	Yes
Junction - hind foot (right) & line (hind leg right)	Junction - hind foot (right) & line (hind leg right)	Yes
Junction - line#1 (forefoot left) & circle … @ 315 degrees	Junction - line#1 (foreleg left) & circle … @ 315 degrees	Yes
None	Junction - line#2 & circle @ 45 degrees	No
Junction - line#2 & circle @ 225 degrees	Junction - line#3 & circle @ 225 degrees	Yes
Junction - line#3 & circle @ 135 degrees	Junction - line#4 & circle @ 135 degrees	Yes
Junction - curve left (tail) & circle @ 180 degrees	Junction - curve left (tail) & circle @ 180 degrees	Yes
Junction - vertical (head line) & circle @ 0 degrees	Junction - circle (head) & circle @ 0 degrees	Yes
Intersection - circle (head) & vertical (head line)	None	No
None	Placement - vertical in center of circle (body)	No

Calculation of Jaccard's Index for the comparison of the Guī pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 26
Total number of features N = 33
For Index of Similarity calculation: M10 = 4; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{26}{4 + 3 + 26} = \frac{26}{33} = 0.7879$$

For N = 33 and $J = 0.7879$; $P < 0.001$

Chart 64
Chinese Yāo (small) Pictogram vs. St. Johns Petroglyph

Yāo pictogram
Image: Frank Chalfant

St. Johns glyph

Part 1. Comparison of line strokes

Yāo pictogram line strokes	St. Johns glyph line strokes	Shared Feature
Vertical #1 (top)	Vertical #1 (top)	Yes
Vertical #2 (center)	Vertical #2 (center)	Yes
Circle #1 (top)	Circle #1 (top)	Yes
Circle #2 (bottom)	Circle #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Yāo pictogram line stroke relations	St. Johns glyph line stroke relations	Shared Relation
Connection - vertical #1 & circle #1	Connection - vertical #1 & circle #1	Yes
Connection - circle #1 & vertical #2	Connection - circle #1 & vertical #2	Yes
Connection - vertical #2 & circle #2	Connection - vertical #2 & circle #2	Yes

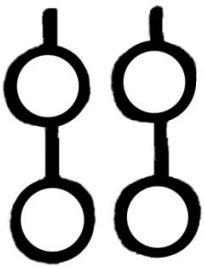
Calculation of Jaccard's Index for the comparison of the Yāo pictogram with the St. Johns petroglyph

Total number of shared features M11 = 7
Total number of features N = 7
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{0 + 0 + 7} = \frac{7}{7} = 1.0000$$

For N = 7 and $J = 1.0000$; P = 0.001

Chart 65
Chinese Yū (very small) Pictogram vs. Piedras Marcadas Petroglyph



Yū pictogram
Image: Frank Chalfant

Piedras Marcadas glyph

Part 1. Comparison of line strokes

Yū pictogram line strokes	**Piedras Marcadas glyph line strokes**	**Shared Feature**
Vertical #1 (top - left & right figures)	Vertical #1 (top - left and right figures)	Yes x2
Vertical #2 (center - left & right figures)	Vertical #2 (center - left & right figures)	Yes x2
Circle #1 (top - left & right figures)	Circle #1 (top - left & right figures)	Yes x2
Circle #2 (bottom - left & right figures)	Circle #2 (bottom - left & right figures)	Yes x2
None	Circle #1 (filled-in)	No x 2
None	Circle #2 (filled-in - left only)	No

Part 2. Comparison of line stroke touch relations

Yū pictogram line stroke relations	**Piedras Marcadas glyph line stroke relations**	**Shared Relation**
Connection - vertical #1 & circle #1	Connection - vertical #1 & circle #1	Yes x2
Connection - circle #1 & vertical #2	Connection - circle #1 & vertical #2	Yes x2
Connection - vertical #2 & circle #2	Connection - vertical #2 & circle #2	Yes x2

Calculation of Jaccard's Index for the comparison of the Yū pictogram with the Piedras Marcadas petroglyph

Total number of shared features M11 = 14
Total number of features N = 17
For Index of Similarity calculation: M10 = 0; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{14}{0 + 3 + 14} = \frac{14}{17} = 0.8235$$

For N = 17 and $J = 0.8235$; $P < 0.001$

Chart 66
Chinese Chuàn (to string together) Pictogram vs. Little Colorado River Petroglyph

Chuàn pictogram
Image: Richard Sears

Little Colorado River glyph

Part 1. Comparison of line strokes

Chuàn pictogram line strokes	Little Colorado glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Oval #1 (top)	Oval #1 (top)	Yes
Oval #2 (bottom)	Oval #2 (bottom)	Yes
None	Dot	No

Part 2. Comparison of line stroke touch relations

Chuàn pictogram line stroke relations	Little Colorado glyph line stroke relations	Shared Relation
Intersection - oval #1 & vertical (top)	Intersection - oval #1 & vertical (top)	Yes
Intersection - oval #1 & vertical (top center)	Intersection - oval #1 & vertical (top center)	Yes
Intersection - oval #2 & vertical (bottom center)	Intersection - oval #2 & vertical (bottom center)	Yes
Intersection - oval #2 & vertical (bottom)	Intersection - oval #2 & vertical (bottom)	Yes
None	Connection - dot & vertical (top)	No

Calculation of Jaccard's Index for the comparison of the Chuàn pictogram with the Little Colorado River petroglyph

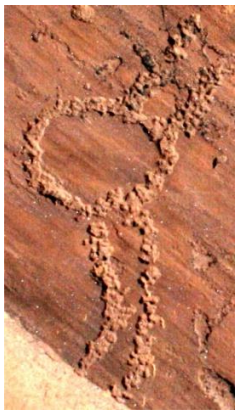
Total number of shared features M11 = 7
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{0 + 2 + 7} = \frac{7}{9} = 0.7778$$

For N = 9 and $J = 0.7778$; P = 0.01

Chart 67
Chinese Liáng (good) Pictogram vs. Lyman Lake Petroglyph

Liáng pictogram
Image: Richard Sears



Lyman Lake glyph

Part 1. Comparison of line strokes

Liáng pictogram line strokes	Lyman Lake glyph line strokes	Shared Feature
Circle	Circle	Yes
Curve down left #1 (top)	Diagonal up #1 (top)	No
Curve down left #2 (top)	Diagonal up #2 (top)	No
Curve up right #1 (bottom)	Curve up right #1 (bottom)	Yes
Curve up right #2 (bottom)	Curve up right #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Liáng pictogram line stroke relations	Lyman Lake glyph line stroke relations	Shared Relation
Junction - circle & curve down left #1	Junction - circle & diagonal up #1	Yes
Junction - circle & curve down left #2	Junction - circle & diagonal up #2	Yes
Junction - circle & curve up right #1	Junction - circle & curve up right #1	Yes
Junction - circle & curve up right #2	Junction - circle & curve up right #2	Yes
Placement - parallel curve down left #1&2	Placement - parallel diagonal up #1&2	Yes
Placement - parallel curve up right #1&2	Placement - parallel curve up right #1&2	Yes
Placement - top curve down left #1&2	Placement - right diagonals #1&2	No
Placement - bottom curve up right #1&2	Placement - bottom curve up right #1&2	Yes

Calculation of Jaccard's Index for the comparison of the Liáng pictogram with the Lyman Lake petroglyph

Total number of shared features M11 = 10
Total number of features N = 13
For Index of Similarity calculation: M10 = 3; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{3 + 0 + 10} = \frac{10}{13} = 0.7692$$

For N = 13 and $J = 0.7692$; $P < 0.01$

Chart 68
Chinese Huí (to return) Pictogram vs. Arizona Ranch Petroglyph

Huí pictogram
Image: L. Wieger

Arizona Ranch glyph

Part 1. Comparison of line strokes

Huí pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Vertical #1 (interior right)	Vertical #1 (interior right)	Yes
Vertical #2 (interior left)	Vertical #2 (interior left)	Yes
Vertical #3 (exterior right)	Vertical #3 (exterior right)	Yes
Vertical #4 (exterior left)	Vertical #4 (exterior left)	Yes
Horizontal #1 (interior top)	Horizontal #1 (interior top)	Yes
Horizontal #2 (interior bottom)	Horizontal #2 (interior bottom)	Yes
Horizontal #3 (exterior top)	Horizontal #3 (exterior top)	Yes
Horizontal #4 (exterior bottom)	Horizontal #4 (exterior bottom)	Yes
Curve-down right (bottom)	Curve-down right (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Huí pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	Yes
Connection - horizontal #1& vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - vertical #2 & horizontal #2	Connection - vertical #2 & horizontal #2	Yes
Connection - horizontal #2 & vertical #3	Connection - horizontal #2 & vertical #3	Yes
Connection - vertical #3 & horizontal #3	Connection - vertical #3 & horizontal #3	Yes
Connection - horizontal #3 & vertical #4	Connection - horizontal #3 & vertical #4	Yes
Connection - vertical #4 & horizontal #4	Connection - vertical #4 & horizontal #4	Yes
Connection - horizontal #4 &… curve-down right	Connection - horizontal #4 &… curve-down right	Yes

Calculation of Jaccard's Index for the comparison of the Huí pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 17
Total number of features N = 17
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{17}{0 + 0 + 17} = \frac{17}{17} = 1.0000$$

For N = 17 and $J = 1.0000$; $P < 0.001$

Chart 69
Chinese Jiū (join) Pictogram vs. Arizona Ranch Petroglyph

Jiū pictogram
Image: Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Jiū pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Vertical #1 (right)	Vertical #1 (right)	Yes
Horizontal #1	Horizontal #1 (bottom)	Yes
Vertical #2 (top middle)	Vertical #2 (middle left)	Yes
Diagonal down #1 (top)	Vertical #3 (middle right)	No
Diagonal up	Horizontal #2 (top)	No
Diagonal down #2 (bottom)	Vertical #4 (left)	No
Vertical #3 (bottom)	None	No

Part 2. Comparison of line stroke touch relations

Jiū pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	Yes
Connection - horizontal #1 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - diagonal down #1 & diagonal up	Connection - vertical #3 & horizontal #2	Yes
Connection - diagonal up & diagonal down #2	Connection - horizontal #2 & vertical #4	Yes
Connection - diagonal down #2 & vertical #3	None	No
Placement - interlocking hooks	Placement - interlocking hooks	Yes

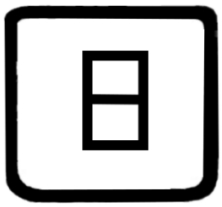
Calculation of Jaccard's Index for the comparison of the Jiū pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 8
Total number of features N = 13
For Index of Similarity calculation: M10 = 5; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{5 + 0 + 8} = \frac{8}{13} = 0.6154$$

For N = 13 and $J = 0.6154$; P = 0.05

Chart 70
Combined Chinese Wéi and Rì Pictograms (City of the Sun) vs. Arizona Ranch Petroglyph



Wéi (exterior) & Rì (interior) pictograms

Arizona Ranch glyph

Images: Richard Sears

Part 1. Comparison of exterior line strokes

Wéi pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Horizontal #1 (top outline)	Horizontal #1 (top outline)	Yes
Horizontal #2 (bottom outline)	Horizontal #2 (bottom outline)	Yes
Vertical #1 (left outline)	Vertical #1 (left outline)	Yes
Vertical #2 (right outline)	Vertical #2 (right outline)	Yes

Part 2. Comparison of exterior line stroke touch relations

Wéi pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	Yes
Connection - horizontal #1 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - vertical #2 & horizontal #2	Connection - vertical #2 & horizontal #2	Yes
Connection - horizontal #2 & vertical #1	Connection - horizontal #2 & vertical #1	Yes

Part 3. Comparison of interior line strokes

Rì pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Horizontal #3 (top interior)	Horizontal #3 (top interior)	Yes
Horizontal #4 (middle interior)	Horizontal #4 (middle interior)	Yes
Horizontal #5 (bottom interior)	Horizontal #5 (bottom interior)	Yes
Vertical #3 (left interior)	Vertical #3 (left interior)	Yes
Vertical #4 (right interior)	Vertical #4 (right interior)	Yes
None	Vertical #5 (bottom interior)	No

Part 4. Comparison of interior line stroke touch relations

Rì pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - vertical #3 & horizontal #3	Connection - vertical #3 & horizontal # 3	Yes
Connection - horizontal #3 & vertical #4	Connection - horizontal #3 & vertical #4	Yes
Connection - vertical #4 & horizontal #5	Connection - vertical #4 & horizontal #5	Yes
Connection - horizontal #5 & vertical #3	Connection - horizontal #5 & vertical #3	Yes
Junction - vertical #3 & horizontal #4	Junction - vertical #3 & horizontal #4	Yes
Junction - horizontal #4 & vertical #4	Junction - horizontal #4 & vertical #4	Yes
None	Connection - horizontal #5 & vertical #5	No

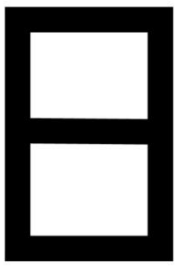
Calculation of Jaccard's Index for the comparison of the combined Wéi & Rì pictograms with the Arizona Ranch petroglyph

Total number of shared features M11 = 19
Total number of features N = 21
For Index of Similarity calculation: M10 = 0; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{19}{0 + 2 + 19} = \frac{19}{21} = 0.9048$$

For N = 21 and $J = 0.9048$; $P < 0.001$

Chart 71
Chinese Rì (sun) Pictogram vs. Arizona Ranch Petroglyph



Rì pictogram
Image: Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Rì pictogram line strokes	Arizona Ranch glyph line strokes	Shared Relation
Horizontal #3 (top interior)	Horizontal #3 (top interior)	Yes
Horizontal #4 (middle interior)	Horizontal #4 (middle interior)	Yes
Horizontal #5 (bottom interior)	Horizontal #5 (bottom interior)	Yes
Vertical #3 (left interior)	Vertical #3 (left interior)	Yes
Vertical #4 (right interior)	Vertical #4 (right interior)	Yes
None	Vertical #5 (bottom interior)	No

Part 2. Comparison of line stroke touch relations

Rì pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Feature
Connection - vertical #3 & horizontal #3	Connection - vertical #3 & horizontal # 3	Yes
Connection - horizontal #3 & vertical #4	Connection - horizontal #3 & vertical #4	Yes
Connection - vertical #4 & horizontal #5	Connection - vertical #4 & horizontal #5	Yes
Connection - horizontal #5 & vertical #3	Connection - horizontal #5 & vertical #3	Yes
Junction - vertical #3 & horizontal #4	Junction - vertical #3 & horizontal #4	Yes
Junction - horizontal #4 & vertical #4	Junction - horizontal #4 & vertical #4	Yes
None	Connection - horizontal #5 & vertical #5	No

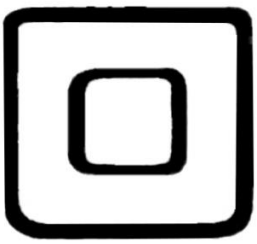
Calculation of Jaccard's Index for the comparison of the Rì pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 11
Total number of features N = 13
For Index of Similarity calculation: M10 = 0; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{11}{0 + 2 + 11} = \frac{11}{13} = 0.8462$$

For N = 13 and $J = 0.8462$; P = 0.001

Chart 72
Chinese Huí (to return; City of Song) Pictogram vs. Arizona Ranch Glyph



Huí pictogram
Image: Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Huí pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Vertical #1 (exterior left)	Vertical #1 (exterior left)	Yes
Vertical #2 (exterior right)	Vertical #2 (exterior right)	Yes
Horizontal #1 (exterior top)	Horizontal #1 (exterior top)	Yes
Horizontal #2 (exterior bottom)	Horizontal #2 (exterior bottom)	Yes
Vertical #3 (interior left)	Vertical #3 (interior left)	Yes
Vertical #4 (interior right)	Vertical #4 (interior right)	Yes
Horizontal #3 (interior top)	Horizontal #3 (interior top)	Yes
Horizontal #4 (interior bottom)	Horizontal #4 (interior bottom)	Yes

Part 2. Comparison of line stroke touch relations

Huí pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	Yes
Connection - horizontal #1& vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - vertical #2 & horizontal #2	Connection - vertical #1 & horizontal #2	Yes
Connection - horizontal #2 & vertical #3	Connection - horizontal #2 & vertical #3	Yes
Connection - vertical #3 & horizontal #3	Connection - vertical #3 & horizontal #3	Yes
Connection - horizontal #3 & vertical #4	Connection - horizontal #3 & vertical #4	Yes
Connection - vertical #4 & horizontal #4	Connection - vertical #4 & horizontal #4	Yes
Connection - horizontal #4 & vertical #4	Connection - horizontal #4 & vertical #4	Yes

Calculation of Jaccard's Index for the comparison of the Huí pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 16
Total number of features N = 16
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{16}{0 + 0 + 16} = \frac{16}{16} = 1.0000$$

For N = 16 and $J = 1.0000$; $P < 0.001$

Chart 73
Chinese Chǐ (teeth) Pictogram vs. Arizona Ranch Petroglyph

Chǐ pictogram
Image: Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Chǐ pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Vertical #1 (exterior left)	Vertical #1 (exterior left)	Yes
Vertical #2 (exterior right)	Vertical #2 (exterior right)	Yes
Horizontal #1 (exterior top)	Horizontal #1 (exterior top)	Yes
Horizontal #2 (exterior bottom)	Horizontal #2 (exterior bottom)	Yes
Vertical #3 (interior left top)	Vertical #3 (interior left top)	Yes
Vertical #4 (interior center top)	Vertical #4 (interior center top)	Yes
Vertical #5 (interior right top)	Vertical #5 (interior right top)	Yes
Vertical #6 (interior left bottom)	Vertical #6 (interior left bottom)	Yes
Vertical #7 (interior center bottom)	Vertical #7 (interior left center bottom)	Yes
None	Vertical #8 (interior right center bottom)	No
Vertical #8 (interior right bottom)	Vertical #9 (interior right bottom)	Yes

Part 2. Comparison of line stroke touch relations

Chǐ pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Junction - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	No
Connection - vertical #1& horizontal #2	Connection - vertical #1 & horizontal #2	Yes
Connection - horizontal #2 & vertical #2	Connection - horizontal #2 & vertical #2	Yes
Junction - vertical #2 & horizontal #1	Connection - vertical #2 & horizontal #1	No
Junction - vertical #3 & horizontal #1	Junction - vertical #3 & horizontal #1	Yes
Junction - vertical #4 & horizontal #1	Junction - vertical #4 & horizontal #1	Yes
Junction - vertical #5 & horizontal #1	Junction - vertical #5 & horizontal #1	Yes
Junction - vertical #6 & horizontal #2	Junction - vertical #6 & horizontal #2	Yes
Junction - vertical #7 & horizontal #2	Junction - vertical #7 & horizontal #2	Yes
None	Junction - vertical #8 & horizontal #2	No
Junction - vertical #8 & horizontal #2	Junction - vertical #9 & horizontal #2	Yes

Calculation of Jaccard's Index for the comparison of the Chǐ pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 18
Total number of features N = 22
For Index of Similarity calculation: M10 = 2; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{18}{2 + 2 + 18} = \frac{18}{22} = 0.8182$$

For N = 22 and $J = 0.8182$; $P < 0.001$

Chart 74
Chinese Fán (sail or wind) Pictogram vs. Sloan Canyon Petroglyph

Fán pictogram
Image: Bernhard Karlgren

Sloan Canyon glyph

Part 1. Comparison of line strokes

Fán pictogram line strokes	Sloan Canyon glyph line strokes	Shared Feature
Right curve	Right curve	Yes
Vertical	Vertical	Yes
Horizontal #1(top)	Horizontal	Yes
Horizontal #2 (bottom)	Diagonal down	No

Part 2. Comparison of line stroke touch relations

Fán pictogram line stroke relations	Sloan Canyon glyph line stroke relations	Shared Relation
Junction - right curve & horizontal #1	Junction - right curve & horizontal	Yes
Junction - right curve & horizontal #2	Junction - right curve & diagonal down	Yes
Junction - vertical & horizontal #1	Junction - vertical & horizontal	Yes
Junction - vertical & horizontal #2	Junction - vertical & diagonal down	Yes

Calculation of Jaccard's Index for the comparison of the Fán pictogram with the Sloan Canyon petroglyph

Total number of shared features M11 = 7
Total number of features N = 8
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{1 + 0 + 7} = \frac{7}{8} = 0.8750$$

For N = 8 and $J = 0.8750$; P = 0.01

Chart 75
Chinese Jié (kneel) Pictogram vs. Rinconada Canyon Petroglyph

Chinese Jié Pictogram
Image: Edoardo Fazzioli

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Jié pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Left curve #1 - top left	Vertical - top left	No
Right curve - top right	Right curve - top right	Yes
Left curve #2 - middle	Left curve - middle	Yes
Arc down - bottom	Arc down - bottom	Yes

Part 2. Comparison of line stroke touch relations

Jié pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Junction - left curve #1 & right curve	Connection - vertical & right curve	No
Connection - right curve & left curve #2	Connection - right curve & left curve	Yes
Connection - left curve #2 & arc down	Connection - left curve & arc down	Yes

Calculation of Jaccard's Index for the comparison of the Jié pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 5
Total number of features N = 7
For Index of Similarity calculation: M10 = 2; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{2 + 0 + 5} = \frac{5}{7} = 0.7143$$

For N = 7 and $J = 0.7143$; P = 0.05

Chart 76
Chinese Xún (10 days or 10 years) vs. Arizona Ranch Petroglyph

Chinese Xún Pictogram
Image: Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Xún pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Diagonal down #1	Diagonal down #1	Yes
Right curve	Right curve	Yes
Diagonal down #2	Diagonal down #2	Yes

Part 2. Comparison of line stroke touch relations

Xún pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Junction - diagonal down #1 & right curve	Junction - diagonal down #1 & right curve	Yes
Connection - right curve & diagonal down #2	Connection - right curve & diagonal down #2	Yes

Calculation of Jaccard's Index for the comparison of the Xún pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 5
Total number of features N = 5
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{0 + 0 + 5} = \frac{5}{5} = 1.0000$$

For N = 5 and $J = 1.0000$; P = 0.01

Chart 77
Chinese Yĭn (secluded) Pictogram vs. Arizona Ranch Petroglyph

Chinese Yĭn Pictogram
Image: Frank Chalfant

Arizona Ranch glyph

Part 1. Comparison of line strokes

Yĭn pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Vertical #1	Vertical	Yes
Horizontal	Horizontal	Yes
Vertical #2	None	No

Part 2. Comparison of line stroke touch relations

Yĭn pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal	Connection - vertical & horizontal	Yes
Connection - horizontal & vertical #2	None	No

Calculation of Jaccard's Index for the comparison of the Yĭn pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 3
Total number of features N = 5
For Index of Similarity calculation: M10 = 2; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{3}{2 + 0 + 3} = \frac{3}{5} = 0.6000$$

For N = 5 and $J = 0.6000$; P = undefined due to insufficient data

Chart 78
Chinese Yǐ (second) Pictogram vs. Arizona Ranch Petroglyph

Chinese Yǐ Pictogram
Image: Frank Chalfant

Arizona Ranch glyph

Part 1. Comparison of line strokes

Yǐ pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Horizontal #1	Horizontal #1	Yes
Diagonal up	Diagonal up	Yes
Horizontal #2	Horizontal #2	Yes

Part 2. Comparison of line stroke touch relations

Yǐ pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - horizontal #1 & diagonal up	Connection - horizontal #1 & diagonal up	Yes
Connection - diagonal up & horizontal #2	Connection - diagonal up & horizontal #2	Yes

Calculation of Jaccard's Index for the comparison of the Yǐ pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 5
Total number of features N = 5
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{0 + 0 + 5} = \frac{5}{5} = 1.0000$$

For N = 5 and $J = 1.0000$; P = 0.01

Chart 79
Chinese Yī (one) Pictogram vs. Arizona Ranch Petroglyph

Chinese Yī Pictogram
Image: Frank Chalfant

Arizona Ranch glyph

Part 1. Comparison of line strokes

Yī pictogram line strokes	**Arizona Ranch glyph line strokes**	**Shared Feature**
Horizontal	Horizontal	Yes

Part 2. Comparison of line stroke touch relations

Yī pictogram line stroke relations	**Arizona Ranch glyph line stroke relations**	**Shared Relation**
None	None	NA

Calculation of Jaccard's Index for the comparison of the Yī pictogram with the Arizona Ranch petroglyph

Total number of shared features: M11 = 1
Total number of features: N = 1
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{1}{0 + 0 + 1} = \frac{1}{1} = 1.0000$$

For N = 1 and $J = 1.0000$; P = undefined due to insufficient data

Chart 80
Chinese Gōng (bow) Pictogram vs. Grapevine Canyon Petroglyph

Gōng pictogram
Image: Richard Sears

Grapevine Canyon paired glyphs
Left: Gōng (bow) & Right: Yǐn (to pull)

Part 1. Comparison of line strokes

Gōng pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
None	Vertical #1	No
Horizontal	Horizontal	Yes
Vertical	Vertical #2	Yes
Left curve	Left curve	Yes
Diagonal up	Vertical #3	No
Diagonal down	Diagonal down	Yes

Part 2. Comparison of line stroke touch relations

Gōng pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
None	Connection - vertical #1 & horizontal	No
Connection - horizontal & vertical	Connection - horizontal & vertical #2	Yes
Connection - vertical & left curve	Connection - vertical #2 & left curve	Yes
Connection - left curve & diagonal up	Connection - left curve & vertical #3	Yes
Connection - diagonal up & diagonal down	Connection - vertical #3 & diagonal down	Yes

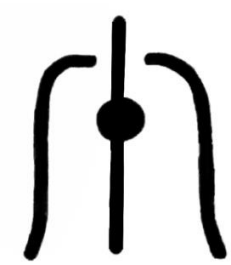
Calculation of Jaccard's Index for the comparison of the Gōng pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 8
Total number of features N = 11
For Index of Similarity calculation: M10 = 1; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{8}{1 + 2 + 8} = \frac{8}{11} = 0.7273$$

For N = 11 and $J = 0.7273$; P = 0.01

Chart 81
Chinese Wŭ (noon) Pictogram vs. Grapevine Canyon Petroglyph



Wŭ pictogram
Image: Frank Chalfant

Grapevine Canyon glyph

Part 1. Comparison of line strokes

Wŭ pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Curve-down left	Curve-down left	Yes
Curve-down right	Curve-down right	Yes
Dot	Dot	Yes

Part 2. Comparison of line stroke touch relations

Wŭ pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
Intersection - dot & vertical	Intersection - dot & vertical	Yes
Placement - curve-down left to left of vertical	Intersection - curve-down left & vertical	No
Placement - curve-down right to right of vertical	Intersection - curve-down right & vertical	No
Placement - dot above center of enclosed vertical	Placement - dot above center of enclosed vertical	Yes

Calculation of Jaccard's Index for the comparison of the Wŭ pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 6
Total number of features N = 8
For Index of Similarity calculation: M10 = 2; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{6}{2 + 0 + 6} = \frac{6}{8} = 0.7500$$

For N = 8 and $J = 0.7500$; P = 0.05

Chart 82
Chinese Mù (tree) Pictogram vs. Arizona Ranch Petroglyph

Mù pictogram
Image: Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Mù pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down #1 (left branch)	Diagonal down #1 (left branch)	Yes
Diagonal up #1 (right branch)	Diagonal up #1 (right branch)	Yes
Diagonal up #2 (left root)	Diagonal up #2 (left root)	Yes
Diagonal down #2 (right root)	Diagonal down #2 (right root)	Yes

Part 2. Comparison of line stroke touch relations

Mù pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Junction - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	Yes
Junction - diagonal up #1 & vertical	Junction - diagonal up #1& vertical	Yes
Junction - diagonal up #2 & vertical	Junction - diagonal up #2 & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down #2 & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Mù pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 83
Chinese Mén (door) Pictogram vs. Little Lake Pictograph

Mén Pictogram

Image: Edoardo Fazzioli

Little Lake glyph

Enhanced image

Part 1. Comparison of line strokes

Note: The broken off rectangular side-by-side images drawn beneath the Little Lake Mén glyph modify the meaning of the overall symbol. These items are unrelated to the basic Chinese script symbol of Mén and are not included in this analysis.

Mén pictogram line strokes	Little Lake glyph line strokes	Shared Feature
Horizontal #1 (top left)	Horizontal #1 (top left)	Yes
Horizontal #2 (middle left)	Horizontal #2 (middle left)	Yes
Horizontal #3 (bottom left)	Horizontal #3 (bottom left)	Yes
Vertical #1 (far left)	Vertical #1 (far left)	Yes
Vertical #2 (middle left)	Vertical #2 (middle left)	Yes
Horizontal #4 (top right)	Horizontal #4 (top right)	Yes
Horizontal #5 (middle right)	Horizontal #5 (middle right)	Yes
Horizontal #6 (bottom right)	Horizontal #6 (bottom right)	Yes
Vertical #3 (middle right)	Vertical #3 (middle right)	Yes
Vertical #4 (far right)	Vertical #4 (far right)	Yes

Part 2. Comparison of line stroke touch relations

Mén pictogram line stroke relations	Little Lake glyph line stroke relations	Shared Relation
Connection - horizontal #1 & vertical #1	None	No
None	Connection - horizontal #1 & vertical #2	No
Junction - horizontal #2 & vertical #1	Connection - horizontal #2 & vertical #1	No
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - horizontal #3 & vertical #1	Junction - horizontal #3 & vertical #1	Yes
Connection - horizontal #3 & vertical #2	Connection - horizontal #2 & vertical #2	Yes
None	Connection - horizontal #4 & vertical #3	No
Connection - horizontal #4 & vertical #4	None	No
Junction - horizontal #5 & vertical #3	Junction - horizontal #5 & vertical #3	Yes
Junction - horizontal #5 & vertical #4	Connection - horizontal #5 & vertical #4	No
Connection - horizontal #6 & vertical #3	Connection - horizontal #6 & vertical #3	Yes
Junction - horizontal #6 & vertical #4	Junction - horizontal #6 & vertical #4	Yes

- Chart continued on the following page -

Calculation of Jaccard's Index for the comparison of the Mén pictogram with the Little Lake pictograph

Total number of shared features M11 = 16
Total number of features N = 22
For Index of Similarity calculation: M10 = 4; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{16}{4 + 2 + 16} = \frac{16}{22} = 0.7273$$

For N = 22 and $J = 0.7273$; $P < 0.001$

Chart 84
Chinese Yĭn (to pull) Pictogram vs. Grapevine Canyon Petroglyph

Yĭn pictogram
Image: Richard Sears

Grapevine Canyon paired glyphs
Left: Gōng (bow) & Right: Yĭn (to pull)

Part 1. Comparison of line strokes

Yĭn pictogram line strokes	Grapevine Canyon glyph line strokes	Shared Feature
None	Horizontal #1 (top)	No
Vertical	Vertical	Yes
Horizontal	Horizontal #2 (bottom)	Yes
Left curve #1	Left curve	Yes
Arc up	Arc down	Yes
Left curve #2	None	No

Part 2. Comparison of line stroke touch relations

Yĭn pictogram line stroke relations	Grapevine Canyon glyph line stroke relations	Shared Relation
None	Connection - horizontal #1 & vertical	No
Junction - horizontal & vertical	Junction - horizontal #2 & vertical	Yes
Connection - vertical & left curve #1	Connection - vertical & left curve	Yes
Connection - left curve & arc up	Connection - left curve & arc down	Yes
Junction - arc up & left curve #2	None	No

Calculation of Jaccard's Index for the comparison of the Yĭn pictogram with the Grapevine Canyon petroglyph

Total number of shared features M11 = 7
Total number of features N = 11
For Index of Similarity calculation: M10 = 2; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{2 + 2 + 7} = \frac{7}{11} = 0.6364$$

For N = 11 and $J = 0.6364$; P = 0.05

Chart 85
Chinese Zhōng (middle) Pictogram vs. Mojave Desert Petroglyph

Zhōng pictogram
Image: L. Wieger

Mojave Desert glyph

Part 1. Comparison of line strokes

Zhōng pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Vertical #1 (center line)	Vertical #1 (center line)	Yes
Vertical #2 (left)	Left curve (left)	No
Vertical #3 (right)	Vertical #2 (right)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes

Part 2. Comparison of line stroke touch relations

Zhōng pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Intersection - vertical #1 & horizontal #1	Intersection - vertical #1 & horizontal #1	Yes
Intersection - vertical #1 & horizontal #2	Intersection - vertical #1 & horizontal #2	Yes
Connection - vertical #2 & horizontal #1 (left)	Connection - left curve & horizontal #1 (left)	Yes
Connection - vertical #2 & horizontal #2 (left)	Connection - left curve & horizontal #2 (left)	Yes
Connection - vertical #3 & horizontal #1 (right)	Connection - vertical #2 & horizontal #1 (right)	Yes
Connection - vertical #3 & horizontal #2 (right)	Connection - vertical #2 & horizontal #2 (right)	Yes

Calculation of Jaccard's Index for the comparison of the Zhōng pictogram with the Mojave Desert petroglyph

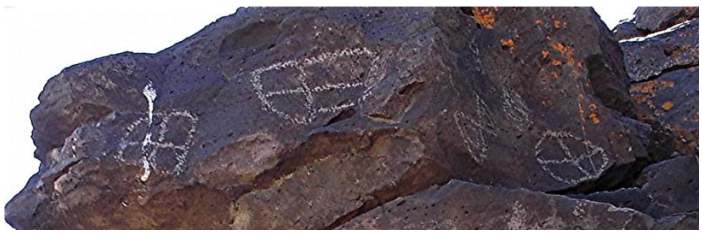
Total number of shared features M11 = 10
Total number of features N = 11
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{1 + 0 + 10} = \frac{10}{11} = 0.9091$$

For N = 11 and $J = 0.9091$; P = 0.001

Chart 86
Chinese Tián (field) Pictogram vs. Mojave Desert Petroglyph

Tián pictogram
Image: Bernhard Karlgren



Mojave Desert glyph (left)

Part 1. Comparison of line strokes

Tián pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Vertical (central)	Vertical (central)	Yes
Horizontal (central)	Horizontal (central)	Yes
Arc down	Arc down	Yes
Arc up	Arc up	Yes

Part 2. Comparison of line stroke touch relations

Tián pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Vertical - intersection horizontal	Vertical - intersection horizontal	Yes
Vertical - junction arc down	Vertical - junction arc down	Yes
Vertical - junction arc down	Vertical - junction arc down	Yes
Horizontal - junction arc connection point	Horizontal - junction arc connection point	Yes
Hoizontal - junction arc connection point	Horizontal - junction arc connection point	Yes
Arc down - connection arc up (left)	Arc down - connection arc up (left)	Yes
Arc down - connection arc up (right)	Arc down - connection arc up (right)	Yes

Calculation of Jaccard's Index for the comparison of the Tián pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 11
Total number of features N = 11
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{11}{0 + 0 + 11} = \frac{11}{11} = 1.0000$$

For N = 11 and $J = 1.0000$; $P < 0.001$

Chart 87
Chinese Composite Dāo & Cì (stab) Pictograms vs. Mojave Desert Paired Petroglyphs

Dāo pictogram
Image: B. Karlgren

Cì pictogram
Image: L. Wieger

Mojave Desert paired glyphs

Part 1. Comparison of Cì line strokes

Cì pictogram line strokes with analogous thorn descriptors	Mojave Desert glyph line strokes with analogous thorn descriptors	Shared Feature
Vertical (central stem)	Vertical (central stem)	Yes
Horizontal (central branch)	Horizontal (central branch)	Yes
Arc up (top branches)	Arc up (top branches)	Yes
Right curve (left branch)	Right curve (left branch)	Yes
Arc down (roots)	Arc down (roots)	Yes
Left curve (right branches)	Left curve (right branches)	Yes

Part 2. Comparison of Cì line stroke touch relations

Cì pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Intersection - horizontal with vertical (center)	Intersection - horizontal with vertical (center)	Yes
Intersection - vertical with arc up	Junction - vertical with arc up	No
Junction - horizontal with right curve	Junction - horizontal with right curve	Yes
Intersection - vertical with arc down	Junction - vertical with arc down	No
Junction - horizontal with left curve	Junction - horizontal with left curve	Yes

Part 3. Comparison of Dāo line strokes

Dāo pictogram line strokes	Mojave Desert glyph line strokes	Shared Relation
Diagonal down	Diagonal down	Yes
Diagonal up	Diagonal up #1	Yes
Curve-up right	Diagonal up #2	No

Part 4. Comparison of Dāo line stroke touch relations

Dāo pictogram line stroke touch relations	Mojave Desert glyph line stroke touch relations	Shared Relation
Connection - diagonal down & diagonal up	Connection - diagonal down & diagonal up #1	Yes
Connection - curve-up right & diagonal up	Connection - diagonal up #1 & diagonal up #2	Yes
Placement - Dāo figure alongside of Cì	Placement - Dāo figure alongside of Cì	Yes

- Chart continued on the following page -

Calculation of Jaccard's Index for the comparison of the composite Dāo & Cì pictograms with the Mojave Desert paired petroglyphs

Total number of shared features M11 = 14
Total number of features N = 17
For Index of Similarity calculation: M10 = 3; M01= 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{14}{3 + 0 + 14} = \frac{14}{17} = 0.8235$$

For N = 17 and $J = 0.8235$; $P < 0.001$

Chart 88
Chinese Zhōu (boat) Pictogram vs. Tenmile Draw Petroglyph

Zhōu pictogram
Image: Richard Sears

Tenmile Draw glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes	Tenmile Draw glyph line strokes	Shared Feature
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Vertical #1 (left)	Vertical #1 (left)	Yes
Vertical #2 (right)	Vertical #2 (right)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Diagonal up	Diagonal up	Yes
Diagonal down	Diagonal down	Yes

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	Tenmile Draw glyph line stroke relations	Shared Relation
Junction - horizontal #1 & vertical #1	Junction - horizontal #1 & vertical #1	Yes
Junction - horizontal #1 & vertical #2	Junction - horizontal #1 & vertical #2	Yes
Junction - vertical #1 & horizontal #2	Junction - vertical #1 & horizontal #2	Yes
Junction - vertical #2 & horizontal #2	Junction - vertical #2 & horizontal #2	Yes
Connection - horizontal #2 & diagonal up	Connection - horizontal #2 & diagonal up	Yes
Connection - horizontal #2 & diagonal down	Connection - horizontal #2 & diagonal down	Yes

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Tenmile Draw petroglyph

Total number of shared features M11 = 12
Total number of features N = 12
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{12}{0 + 0 + 12} = \frac{12}{12} = 1.0000$$

For N = 12 and $J = 1.0000$; $P < 0.001$

Chart 89
Chinese Mù (tree) Pictogram vs. Hardscrabble Wash Petroglyph

Mù pictogram
Image: Richard Sears

Hardscrabble Wash glyph

Part 1. Comparison of line strokes

Mù pictogram line strokes and analogous tree descriptors	**Hardscrabble Wash glyph line strokes and analogous tree descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down #1 (left branch)	Diagonal down #1 (left branch)	Yes
Diagonal up #1 (right branch)	Diagonal up #1(right branch)	Yes
Diagonal up #2 (left root)	Diagonal up #2 (left root)	Yes
Diagonal down #2 (right root)	Diagonal down #2 (right root)	Yes

Part 2. Comparison of line stroke touch relations

Mù pictogram line stroke relations	**Hardscrabble Wash glyph line stroke relations**	**Shared Relation**
Junction - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	Yes
Junction - diagonal up #1 & vertical	Junction - diagonal up #1 & vertical	Yes
Junction - diagonal up #2 & vertical	Junction - diagonal up #2 & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down #2 & vertical	Yes

Calculation of Jaccard's Index for the comparison of the Mù pictogram with the Hardscrabble Wash petroglyph

Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 90
Chinese Wú (no or not) Pictogram vs. Rinconada Canyon Petroglyph

Wú pictogram
Image: Richard Sears

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Wú pictogram line strokes	Rinconada Canyon glyph line-strokes	Shared Feature
Diagonal up #1 (left top)	Diagonal up #1 (left top)	Yes
Diagonal up #2 (right bottom)	Diagonal up #2 (right bottom)	Yes
Diagonal up #3 (center)	Diagonal up #3 (center)	Yes
Diagonal down #1 (right top)	Diagonal down #1 (right top)	Yes
Diagonal down #2 (left bottom)	Diagonal down #2 (left bottom)	Yes
Diagonal down #3 (center)	Diagonal down #3 (center)	Yes

Part 2. Comparison of line stroke touch relations

Wú pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Connection - diagonal up #1 & diagonal down #1	Connection - diagonal up #1 & diagonal down #1	Yes
Connection - diagonal down #1 & diagonal up #2	Connection - diagonal down #1 & diagonal up #2	Yes
Connection - diagonal up #2 & diagonal down #2	Connection - diagonal up #2 & diagonal down #2	Yes
Connection - diagonal down #2 & diagonal up #1	Connection - diagonal down #2 & diagonal up #1	Yes
Intersection - diagonal up #3 & diagonal down #3	Intersection - diagonal up #3 & diagonal down #3	Yes
Intersection - diagonal up #1 & diagonal down #3	Intersection - diagonal up #1 & diagonal down #3	Yes
Intersection - diagonal down #1 & diagonal up #3	Intersection - diagonal down #1 & diagonal up #3	Yes
Intersection - diagonal up #2 & diagonal down #3	Intersection - diagonal up #2 & diagonal down #3	Yes
Intersection - diagonal down #2 & diagonal up #3	Intersection - diagonal down #2 & diagonal up #3	Yes

Calculation of Jaccard's Index for the comparison of the Wú pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 15
Total number of features N = 15
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{15}{0 + 0 + 15} = \frac{15}{15} = 1.0000$$

For N = 15 and $J = 1.0000$; $P < 0.001$

Chart 91
Chinese Bāng (state or nation) Pictogram vs. Mojave Desert Petroglyph

Bāng pictogram
Image: Bernhard Karlgran

Mojave Desert glyph

Part 1. Comparison of line Strokes

Bāng pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Vertical #1 (lower left)	Vertical #1 (lower left)	Yes
Vertical #2 (lower center)	Vertical #2 (lower center)	Yes
Vertical #3 (lower right)	Vertical #3 (lower right)	Yes
Vertical #4 (top center)	Vertical #4 (top center)	Yes
Horizontal #1 (lower top)	Horizontal #1 (lower top)	Yes
Horiaontal #2 (lower middle)	Horizontal #2 (lower middle)	Yes
Horiaontal #3 (lower bottom)	Horizontal #3 (lower bottom)	Yes
Diagonal down #1 (top left)	Curve-up left (top left)	No
Diagonal up #1 (top right)	Curve-up right (top right)	No
Diagonal down #2 (middle left)	Diagonal down #1(top middle left)	Yes
Diagonal up #2 (middle right)	Diagonal up #2 (top middle right)	Yes
None	Diagonal down #3 (top bottom left)	No

Part 2. Comparison of line stroke touch relations

Bāng pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Connection - vertical #1 & horizontal #1	Connection - vertical #1 & horizontal #1	Yes
Junction - vertical #1 & horizontal #2	Junction - vertical #1 & horizontal #2	Yes
Connection - vertical #1 & horizontal #3	Connection - vertical #1 & horizontal #3	Yes
Junction - vertical #2 & horizontal #1	Junction - vertical #2 & horizontal #1	Yes
Intersection - vertical #2 & horizontal #2	Intersection - vertical #2 & horizontal #2	Yes
Junction - vertical #2 & horizontal #3	Junction - vertical #2 & horizontal #3	Yes
Connection - vertical #3 & horizontal #1	Connection - vertical #3 & horizontal #1	Yes
Junction - vertical #3 & horizontal #2	Junction - vertical #3 & horizontal #2	Yes
Connection - vertical #3 & horizontal #3	Connection - vertical #3 & horizontal #3	Yes
Junction - vertical #4 & horizontal #1	Junction - vertical #4 & horizontal #1	Yes
Junction - diagonal down #1 & vertical #4	Junction - curve-up left & vertical #4	Yes
Junction - diagonal up #1 & vertical #4	Junction - curve-up right & vertical #4	Yes
Junction - diagonal down #2 & vertical #4	Junction - diagonal down #1& vertical #4	Yes
Junction - diagonal up #2 & vertical #4	Junction - diagonal up #1 & vertical #4	Yes
None	Junction - diagonal down #3 & vertical #4	No

- Chart continued on the following page -

Calculation of Jaccard's Index for the comparison of the Bāng pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 23
Total number of features N = 27
For Index of Similarity calculation: M10 = 2; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{23}{2 + 2 + 23} = \frac{23}{27} = 0.8519$$

For N = 27 and $J = 0.8519$; $P < 0.001$

Chart 92
Chinese Zhōu (boat) Pictogram vs. Mojave Desert Petroglyph

Zhōu pictogram
Image: Bernhard Karlgren

Mojave Desert glyph

Part 1. Comparison of line strokes

Zhōu pictogram line strokes and analogous boat descriptors	Mojave Desert glyph line strokes and analogous boat descriptors	Shared Feature
Right curve #1 (left hull + strake)	Right curve #1 (left hull + strake)	Yes
Right curve #2 (right hull + strake)	Right curve #2 (right hull + strake)	Yes
Diagonal up (bow)	Arc down (bow)	Yes
None	Horizontal #1 (bow thwart)	No
Horizontal #1 (midship thwart)	Horizontal #2 (midship thwart)	Yes
Horizontal #2 (stern)	Horizontal #3 (stern)	Yes
Wavy line (water)	Wavy line (water)	Yes

Part 2. Comparison of line stroke touch relations

Zhōu pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Placement - right curve #1 parallel right curve #2	Placement - right curve #1 parallel right curve #2	Yes
Junction - diagonal up & right curve #1	Connection - arc down & vertical left	No
Junction - diagonal up & right curve #2	Connection - arc down & vertical right	No
Junction - horizontal #1 & right curve #1	Junction - horizontal #1 & right curve #1	Yes
Junction - horizontal #1 & right curve #2	Junction - horizontal #1 & right curve #2	Yes
None	Junction - horizontal #2 & right curve #1	No
None	Junction - horizontal #2 & right curve #2	No
Junction - horizontal #2 & right curve #1	Junction - horizontal #3 & right curve #1	Yes
Junction - horizontal #2 & right curve #2	Junction - horizontal #3 & right curve #2	Yes
Connection - wavy line & right curve #2 (top)	Connection - wavy line & right curve #1 (bottom)	No

Calculation of Jaccard's Index for the comparison of the Zhōu pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 11
Total number of features N = 17
For Index of Similarity calculation: M10 = 3; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{11}{3 + 3 + 11} = \frac{11}{17} = 0.6471$$

For N = 17 and $J = 0.6471$; P = 0.01

Chart 93
Chinese Lǔ (salt) Pictogram vs. Zuni Wash Petroglyph

Lǔ pictogram
Image: L. Wieger

Zuni Wash glyph

Part 1. Comparison of line strokes

Lǔ pictogram line strokes	Zuni Wash glyph line strokes	Shared Feature
Horizontal #1 (top handle	None	No
Horizontal #2 (top)	Horizontal #1 (top)	Yes
Horizontal #3 (bottom)	Horizontal #2 (bottom)	Yes
Vertical #1 (top handle)	Vertical #1 (top handle)	Yes
Vertical #2 (left side)	Vertical #2 (left side)	Yes
Vertical #3 (right side)	Vertical #3 (right side)	Yes
Diagonal up	Diagonal up	Yes
Diagonal down	Diagonal down	Yes
Horizontal #4 (dash top)	Horizontal #4 (dash top)	Yes
Horizontal #5 (dash bottom)	Horizontal #5 (dash bottom)	Yes
Vertical #4 (dash left interior)	Circle #1 (left interior)	No
Vertical #5 (dash right interior)	Circle #2 (right interior)	No

Part 2. Comparison of line stroke touch relations

Lǔ pictogram line stroke relations	Zuni Wash glyph line stroke relations	Shared Relation
Junction - vertical #1 and horizontal #1	None	No
Junction - vertical #1 & horizontal #2	Junction - vertical #1 & horizontal #1	Yes
Connection - horizontal #2 & vertical #2	Connection - horizontal #1 & vertical #2	Yes
Connection - vertical #2 & horizontal #3	Connection - vertical #2 & horizontal #2	Yes
Connection - horizontal #3 & vertical #3	Connection - horizontal #2 & vertical #3	Yes
Connection - vertical #3 & horizontal #2	Connection - vertical #3 & horizontal #1	Yes
Junction - diagonal up & bottom left corner	Junction - diagonal up & bottom left corner	Yes
Junction - diagonal up & top right corner	Junction - diagonal up & top right corner	Yes
Junction - diagonal down & top left corner	Junction - diagonal down & top left corner	Yes
Junction - diagonal down & bottom right corner	Junction - diagonal down & bottom right corner	Yes
Placement - Horizontal #4 in top quadrant	Placement - horizontal #4 in top quadrant	Yes
Placement - horizontal #5 in bottom quadrant	Placement - horizontal #5 in bottom quadrant	Yes
Placement - vertical #4 in left quadrant	Placement - circle #1 in left quadrant	Yes
Placement - vertical #5 in right quadrant	Placement - circle #2 in right quadrant	Yes

Calculation of Jaccard's Index for the comparison of the Lǔ pictogram with the Zuni Wash petroglyph

Total number of shared features M11 = 22
Total number of features N = 26
For Index of Similarity calculation: M10 = 2; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{22}{2 + 2 + 22} = \frac{22}{26} = 0.8462$$

For N = 26 and $J = 0.8462$; $P < 0.001$

Chart 94
Chinese Kùn (difficult) Pictogram vs. Zuni Wash Petroglyph

Kùn pictogram
Image: Ma Ru Sen

Zuni Wash glyph

Part 1. Comparison of line strokes

Kùn pictogram line strokes and analogous descriptors	**Zuni Wash glyph line strokes and analogous descriptors**	**Shared Feature**
Vertical (central trunk)	Vertical (central trunk)	Yes
Diagonal down #1 (left branch)	Diagonal down #1 (left branch)	Yes
Diagonal up #1 (right branch)	Diagonal up #1 (right branch)	Yes
Diagonal up #2 (left root)	Diagonal up #2 (left root)	Yes
Diagonal down #2 (right root)	Diagonal down #2 (right root)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Vertical #1 (left)	Vertical #1 (left)	Yes
Vertical #2 (right)	Vertical #2 (right)	Yes

Part 2. Comparison of line stroke touch relations

Kùn pictogram line stroke relations	**Zuni Wash glyph line stroke relations**	**Shared Relation**
Junction - diagonal down #1 & vertical	Junction - diagonal down #1 & vertical	Yes
Junction - diagonal up #1 & vertical	Junction - diagonal up #1 & vertical	Yes
Junction - diagonal up #2 & vertical	Junction - diagonal up #2 & vertical	Yes
Junction - diagonal down #2 & vertical	Junction - diagonal down #2 & vertical	Yes
Placement - Mù figure within rectangle	Placement - Mù figure within rectangle	Yes

Calculation of Jaccard's Index for the comparison of the Kùn pictogram with the Zuni Wash petroglyph

Total number of shared features M11 = 14
Total number of features N = 14
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{14}{0 + 0 + 14} = \frac{14}{14} = 1.0000$$

For N = 14 and $J = 1.0000$; $P < 0.001$

Chart 95
Chinese Jiū (join) Pictogram vs. Arizona Ranch Petroglyph

Jiū pictogram
Image: Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Jiū pictogram line strokes	Arizona Ranch glyph line strokes	Shared Feature
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Vertical #1 (left)	Vertical #1 (left)	Yes
Horizontal #2 (bottom middle)	Horizontal #2 (bottom middle)	Yes
Diagonal down #1(top middle)	Horizontal #3 (top middle)	No
Vertical #2 (right)	Vertical #2 (right)	Yes
Diagonal down #2 (bottom)	Horizontal #4 (bottom)	No

Part 2. Comparison of line stroke touch relations

Jiū pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Connection - horizontal #1 & vertical #1	Connection - horizontal #1 & vertical #1	Yes
Connection - vertical #1 & horizontal #2	Connection - vertical #1 & horizontal #2	Yes
Connection - diagonal down #1 & vertical #2	Connection - horizontal #3 & vertical #2	No
Connection - vertical #2 & diagonal down #2	Connection - vertical #2 & horizontal #4	No
Placement - interlocking hooks	Placement - interlocking hooks	Yes

Calculation of Jaccard's Index for the comparison of the Jiū pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 7
Total number of features N = 11
For Index of Similarity calculation: M10 = 4; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{4 + 0 + 7} = \frac{7}{11} = 0.6364$$

For N = 11 and $J = 0.6364$; P = 0.05

Chart 96
Chinese Gān (sweet) Pictogram vs. Mojave Desert Petroglyph

Gān pictogram
Image: Chinese Text Project

Mojave Desert glyph

Part 1. Comparison of line strokes

Gān pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Arc up	Arc up	Yes

Part 2. Comparison of line stroke touch relations

Gān pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Junction - horizontal #1 & arc up (left)	Junction - horizontal #1 & arc up (left)	Yes
Junction - horizontal #1 & arc up (right)	Junction - horizontal #1 & arc up (right)	Yes
Junction - horizontal #2 & arc up (left)	Junction - horizontal #2 & arc up (left)	Yes
Junction - horizontal #2 & arc up (right)	Junction - horizontal #2 & arc up (right)	Yes

Calculation of Jaccard's Index for the comparison of the Gān pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 7
Total number of features N = 7
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{0 + 0 + 7} = \frac{7}{7} = 1.0000$$

For N = 7 and $J = 1.0000$; P = 0.001

Chart 97
Chinese Fū (man) Pictogram vs. Mojave Desert Petroglyph

Fū pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Fū pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Horizontal #1	Horizontal #1	Yes
Horizontal #2	Horiztonal #2	Yes
Diagonal up (left)	Diagonal up (left)	Yes
Diagonal down (right)	Diagonal down (right)	Yes

Part 2. Comparison of line stroke touch relations

Fū pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Intersection - vertical & horizontal #1	Intersection - vertical & horizontal #1	Yes
Intersection - vertical & horizontal #2	Intersection - vertical & horizontal #2	Yes
Connection - vertical & diagonal up	Connection - vertical & diagonal up	Yes
Connection - vertical & diagonal down	Connection - vertical & diagonal down	Yes

Calculation of Jaccard's Index for the comparison of the Fū pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 9
Total number of features N = 9
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{0 + 0 + 9} = \frac{9}{9} = 1.0000$$

For N = 9 and $J = 1.0000$; $P < 0.001$

Chart 98
Chinese Mǔ (mother) Pictogram vs. Mojave Desert Petroglyph

Mǔ pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Mǔ pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Left curve	Left curve	Yes
Right curve	Right curve	Yes
Dot (left)	Dot (left)	Yes
Dot (right)	Dot (right)	Yes

Part 2. Comparison of line stroke touch relations

Mǔ pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Junction - vertical & left curve (top)	Junction - vertical & left curve (top)	Yes
Junction - vertical & right curve (top)	Junction -vertical & right curve (top)	Yes
Junction - vertical & left curve (bottom)	Junction - vertical & left curve (bottom)	Yes
Junction - vertical & right curve (bottom)	Junction - vertical & right curve (bottom)	Yes
Placement - dot within left curve	Placement - dot within left curve	Yes
Placement - dot within right curve	Placement - dot within right curve	Yes

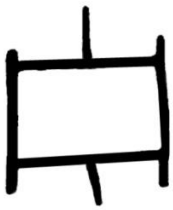
Calculation of Jaccard's Index for the comparison of the Mǔ pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 11
Total number of features N = 11
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{11}{0 + 0 + 11} = \frac{11}{11} = 1.0000$$

For N = 11 and $J = 1.0000$; $P < 0.001$

Chart 99
Chinese Zhù (granary) Pictogram vs. Mojave Desert Petroglyph



Zhù pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Zhù pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Vertical #1 (left)	Vertical #1 (left)	Yes
Vertical #2 (right)	Vertical #2 (right)	Yes
Vertical #3 (top)	Vertical #3 (top)	Yes
Vertical #4 (bottom)	Vertical #4 (bottom)	Yes
None	Dots (millet)	No

Part 2. Comparison of line stroke touch relations

Zhù pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Junction - horizontal #1 & vertical #1	Connection - horizontal #1 & vertical #1	No
Junction - horizontal #1 & vertical #2	Junction - horizontal #1 & vertical #2	No
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #2 & vertical #2	Junction - horizontal #2 & vertical #2	Yes
Junction - vertical #3 & horizontal #1	Junction - vertical #3 & horizontal #1	Yes
Junction - vertical #4 & horizontal #2	Junction - vertical #4 & horizontal #2	Yes
None	Placement - dots within center	No

Calculation of Jaccard's Index for the comparison of the Zhù pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 10
Total number of features N = 14
For Index of Similarity calculation: M10 = 2; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{2 + 2 + 10} = \frac{10}{14} = 0.7143$$

For N = 14 and $J = 0.7143$; P = 0.01

Chart 100
Chinese Jiŭ (liquor) Pictogram vs. Mojave Desert Petroglyph

Jiŭ pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Jiŭ pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Oval cartouche	Oval cartouche	Yes
Vertical #1 (left)	Vertical #1 (left)	Yes
Vertical #2 (right)	Vertical #2 (right)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (middle)	Horizontal #2 (middle)	Yes
Horizontal #3 (bottom)	Horizontal #3 (bottom)	Yes
Water symbol (left)	Water symbol (right)	Yes

Part 2. Comparison of line stroke touch relations

Jiŭ pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Junction - vertical #1 & horizontal #1	Junction - vertical #1 & horizontal #1	Yes
Junction - vertical #2 & horizontal #1	Junction - vertical #2 & horizontal #1	Yes
Junction - horizontal #1 & cartouche (left)	junction - horizontal #1 & cartouche (left)	Yes
Junction - horizontal #1 & cartouche (right)	Junction - horizontal #1 & cartouche (right)	Yes
Placement - horizontal #2 below horizontal #1	Placement - horizontal #2 below horizontal #1	Yes
Placement - horizontal #3 below horizontal #2	Placement - horizontal #3 below horizontal #2	Yes
Placement - water symbol left of cartouche	Placement - water symbol right of cartouche	No

Calculation of Jaccard's Index for the comparison of the Jiŭ pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 13
Total number of features N = 14
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{13}{1 + 0 + 13} = \frac{13}{14} = 0.9286$$

For N = 14 and $J = 0.9286$; $P < 0.001$

Chart 101
Part 1: Chinese Guó (nation) Pictogram vs. Mojave Desert Petroglyph

Guó pictogram
Image: Richard Sears

Mojave Desert glyphs

Part 1. Comparison of line strokes

Guó pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Smooth-edged cartouche	Smooth-edged cartouche	Yes
Diagonal up	None	No
Diagonal down	None	No
Vertical #1 (left)	Vertical #1 (left)	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (middle)	Horizontal #2 (middle)	Yes

Part 2. Comparison of line stroke touch relations

Guó pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Junction - diagonal up & cartouche (left)	None	No
Junction - diagonal down & cartouche (top)	None	No
Intersection - vertical & horizontal #1	Intersection - vertical & horizontal #1	Yes
Junction - vertical & horizontal #2	Junction - vertical & horizontal #2	Yes
Placement - Tǔ script within cartouche	Placement - Tǔ script within cartouche	Yes

Part 1: Calculation of Jaccard's Index for the comparison of the Guó pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 7
Total number of features N = 11
For Index of Similarity calculation: M10 = 4; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{4 + 0 + 7} = \frac{7}{11} = 0.6364$$

For N = 11 and $J = 0.6364$; P = 0.05

- Chart continued on the following page -

Part 2: Chinese Wáng (king) Pictogram vs. Mojave Desert Petroglyph

Wáng pictogram
Image: Frank Chalfant

Mojave Desert glyphs

Part 1. Comparison of line strokes

Wáng pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Vertical	Vertical	Yes
Dot #1 (top)	Dot #1 (top)	Yes
Dot #2 (middle)	Dot #2 (middle)	Yes
Dot #3 (bottom)	Circle (bottom)	No

Part 2. Comparison of line stroke touch relations

Wáng pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Connection - dot #1 & vertical (top)	Connection - dot #1 & vertical (top)	Yes
Intersection - dot #2 & vertical (middle)	Intersection - dot #2 & vertical (middle)	Yes
Connection - dot #3 & vertical (bottom)	Connection - circle & vertical (bottom)	Yes

Part 2: Calculation of Jaccard's Index for the comparison of the Wáng pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 6
Total number of features N = 7
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{6}{1 + 0 + 6} = \frac{6}{7} = 0.8571$$

For N = 7 and $J = 0.8571$; P = 0.01

- Chart continued on the following page -

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Calculation of Jaccard's Index for the comparison of the combined Guó Wáng pictograms with the Mojave Desert petroglyphs

Total number of shared features M11 = 13
Total number of features N = 18
For Index of Similarity calculation: M10 = 5; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{13}{5 + 0 + 13} = \frac{13}{18} = 0.7222$$

For N = 18 and $J = 0.7222$; P = 0.001

Chart 102
Chinese Gān (dry) Pictogram vs. Mojave Desert Petroglyph

Gān pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Gān pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Arc up	Arc up	Yes
Vertical	Vertical	Yes
Horizontal	Horizontal	Yes

Part 2. Comparison of line stroke touch relations

Gān pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Junction - arc up & vertical	Junction - arc up & vertical	Yes
Intersection - vertical & horizontal	Intersection - vertical & horizontal	Yes

Calculation of Jaccard's Index for the comparison of the Gān pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 5
Total number of features N = 5
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{5}{0 + 0 + 5} = \frac{5}{5} = 1.0000$$

For N = 5 and $J = 1.0000$; P = 0.01

Chart 103
Chinese Jiàn (look or see) Pictogram vs. Mojave Desert Petroglyph

Jiàn pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Jiàn pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Oval cartouche	Oval cartouche	Yes
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Left curve (left)	Wavy line #1 (left)	No
Wavy line (right)	Wavy line #2 (right)	Yes

Part 2. Comparison of line stroke touch relations

Jiàn pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Junction - cartouche & horizontal #1 (left)	Junction - cartouche & horizontal #1 (left)	Yes
Junction - cartouche & horizontal #1 (right)	Junction - cartouche & horizontal #1 (right)	Yes
Junction - cartouche & horizontal #2 (left)	Junction - cartouche & horizontal #2 (left)	Yes
Junction - cartouche & horizontal #2 (right)	Junction - cartouche & horizontal #2 (right)	Yes
Junction - cartouche & left curve	Junction - cartouche & wavy line #1	Yes
Junction - cartouche & wavy line	Junction - cartouche & wavy line #2	Yes

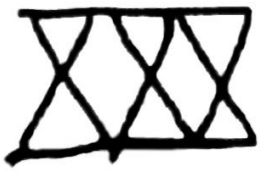
Calculation of Jaccard's Index for the comparison of the Jiàn pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 10
Total number of features N = 11
For Index of Similarity calculation: M10 = 1; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{1 + 0 + 10} = \frac{10}{11} = 0.9091$$

For N = 11 and $J = 0.9091$; P = 0.001

Chart 104
Chinese Wăng (net) Pictogram vs. Mojave Desert Petroglyph



Wăng pictogram
Image: Bernhard Karlgren

Mojave Desert glyph

Part 1. Comparison of line strokes

Wăng pictogram line strokes	**Mojave Desert glyph line strokes**	**Shared Feature**
Horizontal #1 (top)	Horizontal #1 (top)	Yes
Horizontal #2 (bottom)	Horizontal #2 (bottom)	Yes
Cross-hatch line pattern	Cross-hatch line pattern	Yes

Part 2. Comparison of line stroke touch relations

Wăng pictogram line stroke relations	**Mojave Desert glyph line stroke relations**	**Shared Relation**
Placement - horizontal #1 parallel horizontal #2	Placement - horizontal #1 parallel horizontal #2	Yes
Junction - horizontal #1 & cross-hatch lines (top)	Junction - horizontal #1 & cross-hatch lines (top)	Yes
Junction - horizontal #2 & … cross-hatch lines (bottom)	Junction - horizontal #2 & … cross-hatch lines (bottom)	Yes

Calculation of Jaccard's Index for the comparison of the Wăng pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 6
Total number of features N = 6
For Index of Similarity calculation: M10 = 0; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{6}{0 + 0 + 6} = \frac{6}{6} = 1.0000$$

For N = 6 and $J = 1.0000$; P = 0.01

Chart 105
Chinese Jiā (home) Pictogram vs. Arizona Ranch Petroglyph

Jiā pictogram
Image:Richard Sears

Arizona Ranch glyph

Part 1. Comparison of line strokes

Jiā pictogram line strokes	Arizonal Ranch glyph line strokes	Shared Feature
Arc down (head)	Arc down (head)	Yes
Vertical (forebody)	Diagonal up #1 (forebody)	No
Diagonal up #1 (front leg)	Left curve #1 (front leg)	No
Diagonal up #2 (front leg)	Left curve #2 (front leg)	No
Diagonal down (body)	Diagonal down (body)	Yes
Horizonal (rear leg)	Horizontal (rear leg)	Yes
Diagonal up #3 (rear leg)	Diagonal up #2 (rear leg)	Yes
Curve-down right (tail)	None	No

Part 2. Comparison of line stroke touch relations

Jiā pictogram line stroke relations	Arizona Ranch glyph line stroke relations	Shared Relation
Junction - vertical & arc down	Junction - diagonal up & arc down	Yes
Junction - diagonal up #1 & vertical	Connection - left curve #1 & diagonal up #1	Yes
Connection - vertical & diagonal down	None	No
Connection - diagonal up #2 & diagonal down	Connection - left curve #2 & diagonal down	Yes
Connection - horizontal & diagonal down	Connection - horizontal & diagonal down	Yes
Connection - diagonal up #3 & diagonal down	Connection - diagonal up #2 & diagonal down	Yes
Connection - curve-down right & diagonal down	None	No

Calculation of Jaccard's Index for the comparison of the Jiā pictogram with the Arizona Ranch petroglyph

Total number of shared features M11 = 9
Total number of features N = 15
For Index of Similarity calculation: M10 = 3; M01 = 3

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{9}{3 + 3 + 9} = \frac{9}{15} = 0.6000$$

For N = 15 and $J = 0.6000$; P = 0.05

Chart 106
Chinese Zōng (ancestor) Pictogram vs. Mojave Desert Petroglyph

Zōng pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Zōng pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Arc down (top)	Horizontal #1 (top)	No
Horizontal #1 (top)	None	No
Horizontal #2 (lower top)	Horizontal #2 (lower top)	Yes
Vertical #1 (right)	Vertical #1 (right)	Yes
Vertical #2 (right middle)	Vertical #2 (right middle)	Yes
Vertical #3 (center)	Vertical #3 (center)	Yes
Vertical #4 (left middle)	Vertical #4 (left middle)	Yes
Vertical #5 (left)	Vertical #5 (left)	Yes

Part 2. Comparison of line stroke touch relations

Zōng pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Connection - arc down & vertical #1	Connection - horizontal #1 & vertical #1	Yes
Connection - arc down & vertical #5	Connection - horizontal #1 & vertical #5	Yes
Placement - horizontal #1 below arc down	None	No
Junction - horizontal #2 & vertical #1	Junction - horizontal #2 & vertical #1	Yes
Junction - horizontal #2 & vertical #5	Junction - horizontal #2 & vertical #5	Yes
Placement - vertical #2 between verticals #1 & #3	Junction - vertical #2 & horizontal #2	No
Placement - vertical #4 between verticals #3 & #5	Junction - vertical #4 & horizontal #2	No
Junction - vertical #3 & horizontal #2	Intersection - vertical #3 & horizontal #2	No
None	Junction - vertical #3 & horizontal #1	No

Calculation of Jaccard's Index for the comparison of the Zōng pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 10
Total number of features N = 17
For Index of Similarity calculation: M10 = 6; M01 = 1

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{10}{6 + 1 + 10} = \frac{10}{17} = 0.5882$$

For N = 17 and $J = 0.5882$; P = 0.05

Chart 107
Chinese Cè (book) Pictogram vs. Mojave Desert Petroglyph

Cè pictogram
Image: Richard Sears

Mojave Desert glyph

Part 1. Comparison of line strokes

Cè pictogram line strokes	Mojave Desert glyph line strokes	Shared Feature
Left curve	Left curve	Yes
Vertical #1 (right)	Vertical #1 (right)	Yes
Vertical #2 (right middle)	Vertical #2 (right middle)	Yes
Vertical #3 (center)	Vertical #3 (right center)	Yes
Vertical #4 (left middle)	Vertical #4 (left center)	Yes
Vertical #5 (left)	Vertical #5 (left middle)	Yes
None	Vertical #6 (left)	No

Part 2. Comparison of line stroke touch relations

Cè pictogram line stroke relations	Mojave Desert glyph line stroke relations	Shared Relation
Placement - vertical #1 closing end of left curve	Placement - vertical #1 closing end of left curve	Yes
Placement - vertical #2 transvers left curve	Placement - vertical #2 transverse left curve	Yes
Placement - vertical #3 transverse left curve	Placement - vertical #3 transverse left curve	Yes
Placement - vertical #4 transverse left curve	Placement - vertical #4 transverse left curve	Yes
Placement - vertical #5 transverse left curve	Placement - vertical #5 transverse left curve	Yes
None	Placement - vertical #6 junction left curve	No

Calculation of Jaccard's Index for the comparison of the Cè pictogram with the Mojave Desert petroglyph

Total number of shared features M11 = 11
Total number of features N = 13
For Index of Similarity calculation: M10 = 0; M01 = 2

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{11}{0 + 2 + 11} = \frac{11}{13} = 0.8462$$

For N = 13 and $J = 0.8462$; P = 0.001

Chart 108
Chinese Suàn (to count) Pictogram vs. Rinconada Canyon Petroglyph

Suàn pictogram
Image: Richard Sears

Rinconada Canyon glyph

Part 1. Comparison of line strokes

Suàn pictogram line strokes	Rinconada Canyon glyph line strokes	Shared Feature
Zhú pictogram (top)	Zhú pictogram (top)	Yes
Gŏng pictogram (bottom)	Gŏng pictogram (bottom)	Yes
Square	Square	Yes
Horizontal #1 (within square)	Vertical #1 (within square)	No
Horizontal #2 (within square)	Vertical #2 (within square)	No

Part 2. Comparison of line stroke touch relations

Suàn pictogram line stroke relations	Rinconada Canyon glyph line stroke relations	Shared Relation
Placement – square between pictogram sets	Placement – square between pictogram sets	Yes
Placement – chi pictogram at top facing down	Placement – chi pictogram at top facing down	Yes
Placement – gong pictogram at bottom facing up	Placement – gong pictogram at bottom facing up	Yes
Placement – horizontals inside square	Placement – verticals inside square	Yes

Calculation of Jaccard's Index for the comparison of the Suàn pictogram with the Rinconada Canyon petroglyph

Total number of shared features M11 = 7
Total number of features N = 9
For Index of Similarity calculation: M10 = 2; M01 = 0

$$\text{Jaccard's Index } (J) = \frac{M11}{M10 + M01 + M11} = \frac{7}{2 + 0 + 7} = \frac{7}{9} = 0.7778$$

For N = 9 and $J = 0.7778$; P = 0.01

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Index

Alphabetical Index of Representative Ancient Chinese Pictogram-Glyphs

Created by: Richard Gonsalves

Chart Find	Chinese Script	Petroglyph
112 An1 (peace) Piedras Marcadas, NM P = 0.01		
91 Bang1 (Nation) Surprise Tank, CA P=<0.001		
144 Cǎo3 (grass) Winslow, AZ P<0.001		
107 Ce4 (book) Surprise Tank, CA P=0.001		
54 Che4 (plant) Piedras Marcadas, NM P=0.01		
26 Chi3 (teeth) Grapevine Canyon, NV P<0.001		
137 Chu1 (send out) Carr Wash, AZ P<0.001		
57 Chuan4 (string together) Sloan Canyon, NV P=0.001		
21 Ci4 (thorns) Kenton, OK P<0.001		
47 Da Jia (3rd Shang King) Rinconada Canyon, NM P=0.05		
130 Di4 (supreme god) River Run, AZ P=0.01		

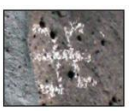
Chart Find	Chinese Script	Petroglyph
74 Fan2 (wind or sail) Sloan Canyon, NV P=0.01		
128 Fei1 (not) River Run, AZ P=0.01		
97 Fu1 (man) Surprise Tank, CA P<0.001		
62 Fu4 (hill) Piedras Marcadas, NM P=0.001		
102 Gan1 (Dry) Surprise Tank, CA P=0.01		
96 Gan1 (sweet) Surprise Tank, CA P=0.001		
48 Gao4 (sacrifice) Piedras Marcadas, NM P<0.001		
138 Ge1 (halberd) Gold Butte, NV P=0.05		
51 Geng1 (7th Heavenly Stem) Rinconada Canyon, NM P=0.01		
80 Gong1 (bow) Grapevine Canyon, NV P=0.01		
63 Gui (turtle) Rinconada Canyon, NM P<0.001		

Chart Find	Chinese Script	Petroglyph
101 Guo2 Wang2 (nation) Surprise Tank, CA P=0.001		
20 Guo3 (fruit tree) Valley of Fire, NV P=0.001		
114 He2 (grain) Black Rocks, UT P=0.001		
126 Hu4 (family) Coyote Creek, AZ P<0.001		
31 Hua1 (flower) Rinconada Canyon, NM P<0.001		
123 Huan2 (Huan River) 5 Sinks, AZ P=0.05		
72 Hui2 (to return) "City Song" Coyote Creek, AZ P<0.001		
46 Ji2 (auspicous) Rinconada Canyon, NM P=0.05		
105 Jia (home) Coyote Creek, AZ P=0.05		
141 Jia3 (Sun measurement tool) Winslow, AZ P=0.01		
103 Jian4 (look,see) Surprise Tank, CA P=0.001		

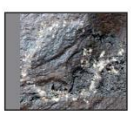
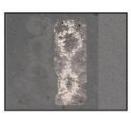
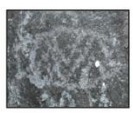
Alphabetical Index of Representative Ancient Chinese Pictogram-Glyphs

Created by: Richard Gonsalves

Chart Find	Chinese Script	Petroglyph	Chart Find	Chinese Script	Petroglyph	Chart Find	Chinese Script	Petroglyph
113 Jiang1 (border) Eagletail Mountians, AZ P<0.001			134 Lu3 (musical tone) Grapevine Canyon, NV P=0.01			131 Ri4 (sun) Rinconada Canyon, NM P=0.05		
75 Jie2 (Kneel) Rinconada Canyon, NM P=0.05			136 Lu3 (music) Grapevine Canyon, NV P=0.05			142 Ri4 (Sun) Winslow, AZ P<0.001		
58 Jin1 (double cloth) Sloan Canyon, NV P=0.01			93 Lu3 (salt) Zuni Wash, AZ P<0.001			143 Ri4 (Sun) Winslow, AZ P<0.001		
69 Jiu1 (join) Coyote Creek, AZ P=0.05			83 Men2 (door) Little Lake, CA P<0.001			147 Sang1 (Mulberry plant) Winslow, AZ P<0.001		
100 Jiu3 (liquor) Surprise Tank, CA P<0.001			34 Mi4 (thread) Petrified Forest, AZ P=0.01			55 She2 (tongue) Grapevine Canyon, NV P=0.05		
94 Kun4 (difficult) Zuni Wash, AZ P<0.001			172 Miao2 (sprouts) Butler Wash, UT P<0.001			119 Sheng1 (grow) Rinconada Canyon, NM P=0.05		
59 Lei2 (thunder) Grapevine Canyon, NV P=0.001			98 Mu3 (mother) Surprise Tank, CA P<0.001			110 Shi2 (time) Surprise Tank, CA P<0.001		
67 Liang2 (good) Lyman Lake, AZ P<0.01			15 Mu4 (tree) Red Canyon, CA P=0.001			148 Shi3 (Arrow) Winslow, AZ P<0.001		
52 Liángzhǔ Emblem Rinconada Canyon, NM P<0.01			41 Peng2 (friendship) Boca Negra Canyon, NM P<0.001			36 Shou3 (hand) Chaco Canyon, NM P=0.001		
109 Ling2 (rain drops) Zuni Wash, AZ P=0.001			117 Qian1 (thousand) Rinconada Canyon, NM P = 0.01			12 Shui3 (water) Anza Borrego, CA P<0.001		
158 Lu3 (musical tone) 10 Mile Canyon, AZ P=0.01			30 Quan3 (dog) Grapevine Canyon, NV P=0.01			108 Suan4 (calculate) Rinconada Canyon, NM P=0.01		

Alphabetical Index of Representative Ancient Chinese Pictogram-Glyphs

Created by: Richard Gonsalves

Chart Find	Chinese Script	Petroglyph
115 Tian1 (god or heaven) Britton, SD P<0.01		
22 Tian2 (field) Piedras Marcadas, NM P=0.001		
45 Tu3 (dirt) Rinconada Canyon, NM P=0.01		
60 Wang2 (necklace) Sloan Canyon, NV P=0.05		
104 Wang3 (net) Surprise Tank, CA P=0.01		
70 Wei4 (enclosure) Coyote Creek, AZ P<0.001		
18 Wei4 (large tree) Painted Rocks, AZ P<0.001		
28 Wen2 (cultured man) Jeffers Petroglyphs, MN P=0.001		
127 Wu1 (shaman) Zuni Wash, NM P<0.001		
90 Wu2 (no or not) Rinconada Canyon, NM P<0.001		
49 Wu3 (five) Piedras Marcadas, NM P<0.001		
81 Wu3 (noon) Grapevine Canyon, NV P=0.05		
118 Wu4 (5th Heavenly stem) Rinconada Canyon, NM P=0.05		
50 Xian4 (to offer in worship) Rinconada Canyon, NM P=0.001		
35 Xiang4 (elephant) Petrified Forest, AZ P<0.001		
53 Xun2 (10 day week) Rinconada Canyon, NM P=0.01		
64 Yao1 (small) St. Johns, AZ P=0.001		
124 Yao1 (walking) Springerville, AZ P=0.001		
79 Yi1 (one) Coyote Creek, AZ P= insufficient data		
78 Yi3 (second) Coyote Creek, AZ P=0.01		
84 Yin3 (arm / pull) Grapevine Canyon, NV P=0.05		
77 Yin3 (secluded) Coyote Creek, AZ P= insufficient data		
125 Yong3 (Bell) 5 Sinks, AZ P=0.01		
65 Yu1 (very small) Piedras Marcadas, NM P<0.001		
13 Yuan1 (pond) Little Lake, CA P<0.001		
140 Zhi3 (embroidery) Winslow, AZ P=0.05		
56 Zhong1 (middle) Grapevine Canyon, NV P=0.001		
7 Zhou1 (boat) Little Lake, CA P<0.01		
99 Zhù4 (granary) Surprise Tank, CA P=0.01		
132 Zi3 (child) Rinconada Canyon, NM P=0.01		
149 Zi4 (nurture / to love) Winslow, AZ P=0.05		
106 Zong1 (ancestor) Surprise Tank, CA P=0.05		

Note: For each Chinese pictogram and petroglyph pairing shown here, the printed P value reflects the statistical probability that the two items may have been created separately and solely by chance.

ACADEMIC COMMENTARY

Contributions to the study by recognized scholars & sinologists.

“The (reading) of the large boulder… Very good. You might, perhaps, see the term Da Jia. A Shang ancestor!” “Persist and publish!” - David N. Keightley, Ph.D.; UC-Berkeley, retired

“John… you don’t need the statistical analysis. They (the study’s pictogram-glyphs) are obviously Chinese script symbols.” - Barrie Schwortz; professional graphic artist and official documenting photographer - 1978 Shroud of Turin Research Project

“About the date of the writings, I think preparatorily, that it is potentially Pro-Qin Dynasty only by writing style.” - Ma Baochun; Capital Normal University, Beijing

“In summation, I judge the findings, analyses, and conclusion documented by Dr. Ruskamp in his research Paper titled *Ancient Chinese Rock Writings Confirm Early Trans-Pacific Interaction* as accurate and worthy of further study, academic discourse, and scholarly publication.” - Song Yaoliang; formerly of Harvard-Yenching Institute, and East China Normal University, China

“Your discovery, I think, is very important for the studies of the relation between the ancient China and America.” - Fan Yuzhou; Nanjing University, China

“I am grateful that you undertook this investigation and whole heartedly applaud uncanny repeated success. The range. The analysis. Permanent advance!” - Cyclone Covey; Wake Forest University, retired

“*Asiatic Echoes* is very scientific and has a lot of very important information supported by really impressive photos of the pictographs.” - Fernando De Trazegnies Granda; Professor Principal de la Pontificia Universidad Catolica del Peru, and former Secretary of State for the country of Peru.

“Believe me; this (find) is not simply about Archaeology, but also LITERATURE. It is a fantastic poem (or lyrics, if people can find the music scores of it), just like those you read in “詩經”(the Shī Jīng).” - Chen Lung-Chung; Professional Chinese business translator, Taipei

"These images do not readily appear to be associated with local tribal entities and based on repatination appear to have antiquity to them." - Michael Medrano, Ph.D., former Chief of Natural Resources for the Petroglyph National Monument

“Compelling evidence!” - William E. Davis, Ph.D., Retired Senior Policy Analyst, U.S. Congress.

“They (the study’s petroglyphs) are all related with the emerging of (Chinese) characters; I think it worth to keep performing more research about them.” - Lu Xiaoqing, Peking University, China

“I was successful in finding the Rinconada petroglyphs, thank you very much. Amazing… Eye-opening… Impressive!” - Stephen C. Jett, Ph.D., UC Davis, retired

“I examined your pdf file and website. I highly respect and appreciate your work. Some of petroglyphs are similar to what I found in Southern Minnesota. Your work is surely groundbreaking and will be a milestone. As more and more people realize this importance, history books will be rewritten.” - Yueh-Ting Lee, Ph.D., Dean of the Graduate School at Southern Illinois University